CANADA'S HIGHLY QUALIFIED MANPOWER RESOURCES

by
A. G. Atkinson
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Research Branch
Program Development Service
DEPARTMENT OF MANPOWER AND IMMIGRATION
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FOREWORD

This study of Canada's Highly Qualified Manpower Resources is one of a series of studies in the programme of research in highly qualified manpower in the Department of Manpower and Immigration. It is the first attempt to construct a view of the size and the more important characteristics of Canada's highly qualified manpower. A wide variety of different statistical sources are examined but special attention is given to scientists and engineers, drawing upon data obtained by the Department of Manpower and Immigration in its 1967 Survey of Scientists and Engineers. Some of the estimates from that survey were made available last year. This study presents the first detailed analysis of the survey results and will be followed by a series of other studies including projections and other analyses of this type of manpower.

The preparation of this study was made possible only by the collaboration of a large number of people in other government departments and in many professional associations who contributed advice and information for all parts of the report. Particular acknowledgement is due to all those associations and individuals who provided advice and assistance with the design and conduct of the 1967 Survey of Scientists and Engineers. These associations provided membership lists for inclusion in the mailing list for the Survey, encouraged their members to respond, provided advice about the information required and participated in discussions of the design of the concepts and measures in relation to the uses to which they would be put by various bodies. These associations included the Royal Architectural Institute of Canada, the Canadian Council of Professional Engineers, the Engineering Institute of Canada, the Canadian Association of Physicists, the Canadian Association of Social Workers, the Chemical Institute of Canada and the Canadian Institute of Forestry. The success of the survey in developing data relevant to practical needs and in achieving a high rate of response is due in no small part to the generous contribution of the officers of these associations. Grateful acknowledgement is also made to other government departments including the Dominion Bureau of Statistics and the then Science Secretariat.

In gathering information about other types of highly qualified manpower the Department was considerably helped by the Health Resources Division of the Department of National Health and Welfare, the Education Division of the Dominion Bureau of Statistics, the Canadian Medical Association, the Canadian Nurses Association, the Canadian Dental Association, and the Association of Canadian Optometrists.

The study was carried out by A. G. Atkinson and Miss E. Richardson, Senior Research Economists in the Department of Manpower and Immigration and by K. J. Barnes of the University of the West Indies, Jamaica, under the general direction of K.V. Pankhurst who also directed the design of the 1967 Survey. The authors were assisted during the summer of 1969 by T. Burrell and B. McGibbon. The tables from the 1967 Survey were developed by A. D. Boyd. D. Dyck and Mrs. E. Sally were responsible for the preparation of some of the statistical material in the report. D. C. Trehearne and H. Moenting of the Manpower Information and Analysis Branch supervised the production of the results of the 1967 Survey of Scientists and Engineers by Messrs. DCF Systems Ltd.

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SUMMARY

Chapter 1

In this chapter the role of highly qualified manpower in economic and social life is considered. In addition to their contribution to cultural and philosophical affairs, highly qualified people are of vital importance in developing knowledge and applying it to society's problems. They are valuable resources in the development of a country. The point is made that although it appears essential to plan the development of highly qualified manpower - especially as the costs of both educating these people and of possibly misallocating them are very high - there has been little attempt in Canada to draw together even the basic information about this group. The purpose of the report is to assemble basic statistics on highly qualified manpower for the further development of policies and research.

The economic background to the employment of highly qualified manpower is discussed. The changes in the factors contributing to the growth of the Canadian economy over the last thirty years have had a direct effect on the employment of highly qualified manpower. "White-collar" occupations have increased as a proportion of the labour force from 24.4% in 1931 to 38.6% in 1961. "Professionals" have increased from 6.1% in 1931 to 10% in 1961. By contrast the manual occupations have remained constant whilst primary occupations have declined.

Chapter 2

This chapter attempts to clarify the scope of the term "highly qualified". From the four definitions discussed, two are selected as appropriate for the scope of the study, namely those in the labour force who possess a university degree, and selected members of the professional and technical class as defined in the Census of Canada.

The Census of Canada is a basic source of information on highly qualified manpower. An analysis is made of the results of the recent Censuses as a background to a consideration of particular occupations. From this analysis the rapid rate of growth of highly qualified manpower is again in evidence. The "professional and technical" class comprised 10% of the labour force in 1961 as compared to only 6.7% in 1941. Furthermore the

growth of professionals has increased at an annual rate of 4% per annum compared with only a 1.9% rate of growth for the employed labour force as a whole. The Census also illustrates very clearly the importance to Canada of foreign-born manpower within the professional group. Whilst 12.4% of the total labour force entered Canada as landed immigrants between 1941 and 1961, 25% of the physical scientists and engineers employed in Canada entered with the same status in the same time period.

Chapter 3

The two main sources of supply of highly qualified manpower for Canada are Canada's higher education system and immigration. These sources provide the main "flows" into the stock of highly qualified manpower. Although Canada's higher education system has expanded rapidly in the last decade, immigration remains a very important source of highly qualified manpower for Canada. In 1969, for example, more qualified physicians entered Canada as landed immigrants than were produced by Canadian Medical Schools. The balance between the output of the domestic education system and immigration is examined and the respective growth rates of the flows from these sources are described. Enrolments for example in pure sciences and education in Canadian universities for the period 1957 to 1967 increased by 450%, and enrolments in arts by 260%. By contrast, medical enrolments increased by only 7% in the same period and engineering by 42%. The flow of immigrant professionals over the last decade has grown at approximately the same rate as the higher education system. The proportion of immigrant professionals in total immigration increased from 4.2% in 1950 to 26% in 1967.

An attempt is made to describe the net contribution of immigration to the stock of highly qualified manpower by subtracting from the immigration flow those who have left Canada to take up employment in the United States of America. In some professions, this reduces the immigration flow by almost 50%.

Separate treatment is given to certain occupations, namely, physicians, dentists, nurses, lawyers, scientists and engineers. The balance between domestic educational output and immigration is examined in some detail for each of these occupations.

Chapter 4

In an attempt to establish a data base on the stock of highly qualified manpower in Canada, the Department of Manpower and Immigration conducted a survey of scientists and engineers in 1967. This chapter presents the main results of the survey; first, a description of the resources of scientists and engineers and their general characteristics, e.g. age, sex, origin and education; second, the utilization of scientists and engineers. This includes an analysis of this type of manpower by sector of employment, work function, and the relation between field of study and field of employment; third, geographical distribution and inter-provincial mobility of scientists and engineers; fourth, analysis of the factors influencing the earnings of scientists and engineers.

The report recognizes that it was not possible to survey the total population of scientists and engineers in Canada. The numbers given are regarded by the authors as a lower limit of the true population.

In the section on Utilization the relationship between the field of study in which a scientist or engineer has received his training and his field of employment is examined. 78% of all scientists hold employment in the same field in which they took their highest degree. This proportion varies however between the major occupational fields.

Almost nine-tenths of those whose highest field of study was architecture were employed in that same field. Of those who studied engineering, 80% stayed in that field, 4% took employment in the physical sciences and 4% in the social sciences. Those who took their highest degree in the physical sciences appeared to be the most flexible group, as only 58% of this group were employed in the physical science occupations. Thus one could argue that a degree in the physical sciences provides a wider range of employment opportunities than a degree in fields such as engineering or architecture which provide a more specific type of training. The relatively low percentage of employment in the same field in which the education was received might also reflect a lack of employment opportunity in a particular occupation.

The functional mobility of scientists and engineers is illustrated in this chapter. For example almost one-third of the scientists and engineers are employed primarily in an administrative or managerial capacity, while 15% reported R. & D. as their prime work function, 13% reported teaching and 8% design. However the importance of the different work functions varies considerably by field of employment. As an illustration, teaching and R. & D. are the prime work functions of 47% of the physical scientists while only 12% of the engineers work in these areas. In contrast, 44%

of the engineers and only 25% of the physical scientists are engaged in administration or supervision. An examination of the relationship between work function and level of experience indicates (especially at the graduate level) a movement of specific activity into a more general supervisory or administrative capacity as the level of experience increases. For example, 50% of the scientists and engineers engaged in design had less than 10 years experience whereas only 17% had 20 or more. Conversely in the more general occupational category - management and supervision of R. & D. - only 13% had less than 10 years experience whilst 40% had 20 or more years. The regional distribution of scientists and engineers is quite distinct from that of the general population. While 35% of the Canadian population live in Ontario, 45.3% of the surveyed scientists and engineers live in this Province. Quebec and the Atlantic provinces, on the other hand, employ a disproportionately smaller share, especially the latter which has 5.7% of the scientific engineering manpower but 9.7% of the population.

The relationship between the earnings of scientists and engineers and such variables as age, sex, experience, education and work function is examined in the final section of Chapter 4.

The age-earnings profile of the managerial and professional occupations is characteristically upward sloping unlike the rather flat age-earnings curve of the unskilled and semi-skilled. This upward trend in earnings with age is particularly evident in the scientific and engineering occupation. Earnings rise most rapidly in the younger age groups reflecting the benefit of experience on-the-job.

The female earnings reported were consistently lower than those of their male counterparts. Part of this variation reflects the fact that more women work part-time and this tends to lower their median earnings. However, even taking this factor into account, the earnings gap is still considerable. For example, there is a $4,000 difference in the median earnings of men and women in the social sciences. In a field such as social work, where two-thirds of the employees are women, the one-third male group has median earnings of $1,800 above those of the female group. Other fields produce similar though less divergent results. Women in the life sciences earn approximately $2,600 less than the men and in the physical sciences, $2,800 less.

The marginal benefit accruing to scientists and engineers with doctorate degrees over those with bachelor's is considerable and increases significantly with age and experience. The average difference in earnings between these two levels of education is greatest in the life sciences, $3,080 per annum, and in the physical sciences $2,700 per annum. The differences for engineers and social scientists are smaller but still substantial, $2,100 and $2,060 respectively.

The median earnings of the scientists and engineers vary considerably depending upon the type of work functions performed. Highest median earnings, $13,700, were reported by those who functioned primarily as administrators or managers. Managers and supervisors of R. & D. ranked second with median earnings of $13,500. Not surprisingly, industrial and management consulting were also highly remunerative work functions with median earnings of $12,120. Counselling and case work produced the lowest median earnings, $7,800.

Chapter 5

This chapter assembles basic information on highly qualified manpower in the health, legal and education professions. The purpose of the chapter is to draw together what scarce data exists on the above professions so that data comparable to that provided on scientists and engineers is readily available.

An examination of the utilization of physicians indicates that there is a rough balance within the profession between general practitioners and specialists; 42% were engaged as general practitioners, 42% as specialists and a residual composed of 8% junior interns and 8% senior interns. In general, health manpower professionals are unequally distributed between provinces. For example, the physician-population ratio ranges from 1:1586 in the Yukon and Northwest Territories to 1:686 in British Columbia. Two-thirds of the dentists and 70% of all optometrists practice in Ontario and Quebec. The three provinces of Ontario, Quebec and British Columbia accounted for almost three-quarters of all licensed pharmacists. In contrast, the distribution of registered nurses employed in nursing is more close to the provincial population distribution than is the case for other health professionals.

Like scientists and engineers, the incomes of self-employed professionals under consideration were higher than those in the employ of others. Physicians had the highest average net income per annum at $27,347; engineers and architects ranked second with $22,111; lawyers and notaries third with $22,014 and dentists were fourth with $17,488.

The median salary for all teachers in public elementary and secondary schools in 1967-68 for all provinces, excluding Quebec was $6,524. The median salary of secondary school teachers was $2,492 higher than that of elementary school teachers. The median salary for full-time university teachers (lay teachers) was $11,403. Salaries of elementary and secondary school teachers vary significantly by province and salaries of university teachers vary significantly by size of institution.

CHAPTER 1

HIGHLY QUALIFIED MANPOWER

I. Introduction

This report is concerned with one aspect of the development of human resources, namely the growth and deployment of highly qualified manpower in Canada. The purpose of the report is to establish a basis of information on the resources of highly qualified manpower in Canada for the further development of policies and research in this field.

Highly qualified manpower is, to the extent that earnings reflect its contribution to production, a valuable economic resource. The professional occupations, for example, within highly qualified manpower constituted 10% of the Canadian labour force in 1961 but their earnings accounted for about 14% of the total earnings of the labour force.

Highly qualified manpower performs important functions in society not always measurable in monetary terms. For example, people in these occupations are generally responsible for managing other types of manpower, for educating and training future generations and for developing basic knowledge and its application. The performance of less educated manpower is often improved if high level manpower is available in sufficient numbers and quality to provide leadership and professional skills. Highly qualified manpower can improve the utilization of other human resources. The health professions, for example, carry out this role by increasing the length of active working lives through improved health care. The reduction in the number of days lost to production through illness and disability makes it possible for the working population as a whole to increase its productive effort.

It is now generally accepted that highly qualified manpower performs an essential role in the generation of economic growth and is a vital component of an economy's labour infrastructure. Not only does this type of manpower serve to stimulate growth, its role in helping to mitigate some of the undesirable effects of growth - environmental pollution and urban transportation problems, for example - is of prime importance. Scientists and engineers as well as social scientists and health manpower play a vital part in improving urban conditions and in planning

the future environment. There is also ample evidence that the more advanced a society, the greater the share of highly qualified manpower will be in its labour force. (1) This is both a cause and an effect of economic development.

Partly in response to the needs of the Canadian economy and partly because of increasing preference among the Canadian population for higher education and for professional careers, the numbers of highly qualified manpower - on any of the definitions of this group described in Chapter 2 of this report - have grown more rapidly in the last 20 years than any other group within the labour force. For example, whereas total employment has grown since 1949 by 50%, the professional and technical occupations - one of the largest groups within highly qualified manpower - have grown by 250% in the same period. Thus the professional and technical occupations have risen as a proportion of the labour force from 6% in 1931 to 10% in 1961, and, according to recent projections made in the Department of Manpower and Immigration, are expected to account for 16% of the labour force in 1975. (2)

One of the most important aspects of highly qualified manpower is that its training and education costs are very large and are increasing rapidly. For example, the combined operating and capital costs of universities and colleges, where the majority of highly qualified manpower is educated, exceeded $1 billion in 1967-68 in Canada. This accounts for 24% of total expenditure on education at all levels and has risen from 14% in 1954. One implication of this rapid growth in the cost of producing highly qualified people is that it becomes even more important to attempt to achieve an efficient allocation of this type of manpower. If highly qualified manpower is well distributed between the different problems within management and production, and if individuals can effectively utilize their skills and training then the benefits will take the form of helping to attain high output, a sustained rate of growth and high individual welfare. For example, an efficient allocation of physicians' services between the different types of health care will lead to an overall improvement in the quality of health care. On the other hand,

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(1) *For example, see 'Manpower Requirements for Planning: An International Comparison Approach". M. A. Horowitz, M. Zymelman and I. L. Herrnstadt, North Eastern University, Massachusetts, U.S.A. 1966.*

(2) *"A Projection of Manpower Requirements by Occupation in 1975", B. Ahamad, Department of Manpower and Immigration, 1969.*

if physicians specialized in one function are not available, then certain activities cannot be undertaken: other specialists will be underemployed and the quality of health care will be reduced. Similarly, if certain types of engineers are scarce then delays can be caused in starting important engineering projects and this results in lost output. The misallocation of highly qualified manpower is therefore very costly.

The relatively heavy investment involved in the formation of highly qualified manpower entails a long gestation period. This covers not only the years of formal university education but both preparation in secondary and even primary school and also development during the course of a working career when skills learned in a theoretical way are improved in practice and extended by experience to new fields. This implies that the adjustment process to correct imbalances of this type of manpower, whether surplus or deficit, will be more complex than for manpower which requires a shorter training period. In Canada, immigration has traditionally formed part of the adjustment process and the Department of Manpower and Immigration has indeed a more selective immigration policy which is increasingly geared to recruiting manpower for those occupations in which scarcity is apparent. Canada relies to a greater extent than most other western countries on immigration for a large part of its supply of highly qualified manpower. A major contribution to Canada's manpower resources is made by education systems overseas. In 1969, for example, more physicians entered Canada from abroad intending to practice medicine than graduated from Canadian medical schools.

Since highly qualified manpower is a valuable resource and since its gestation period is long it would appear important to plan for its future development in addition to its current use. This involves the planning of the capacity of educational institutions and the balance of growth of different disciplines. This broad approach to human resource planning extends to immigration as well. Intending immigrants have to be informed in advance of employment opportunities for their particular skills in Canada. It is also useful for immigration authorities to be able to foresee how and why changes in labour market conditions or other social and economic factors in "donor" countries could cause a sudden change in this supply.

Although the above considerations suggest that more ought to be known about highly qualified manpower and that policies affecting the demand and supply of this particular group should be well informed by the findings of research, there has been little attempt so far to draw together even the most basic information about this group. Highly qualified manpower is possibly Canada's most valuable human resource yet until recently relatively little was known about it. It will be seen, for example, that we are unsure as to how many people there are in some professions.

The purpose of this report therefore, is to assemble the basic statistical information on highly qualified manpower required for the development of policies and research. This will provide a data base giving essential information on factors such as the age, sex, educational background and earnings of highly qualified manpower in Canada. Without this data base further research, for example into the projected future requirements for or future resources of highly qualified manpower, cannot be made. The report describes the main characteristics of those groups of manpower for which sound information is available, and attempts to fit these characteristics into an analytical framework. It is clear however that such a description of manpower resources cannot take place in isolation from a consideration of the economic background to their employment in the Canadian economy. For this reason the next section of this chapter deals with a brief review of the economic considerations affecting the role of this type of manpower in the Canadian economy. Chapter 2 highlights the general characteristics of highly qualified manpower and provides suggestions for alternative definitions of the size of this group. Chapter 3 describes the development of highly qualified manpower resources in the Canadian higher education system and in the flows of highly qualified immigrants to Canada. Chapters 4 and 5 present and analyse the basic statistical information about the resources of highly qualified manpower in Canada.

II. Economic background

A high and steady rate of economic growth has been established as one of the main social and economic goals of Canadian society. (1) The main conditions necessary for achieving such a rate of growth are, first, an increase in productive resources and secondly, an improvement in their quality and utilization. The second condition results in higher productivity and is associated with a number of factors including increased investment in human skills and knowledge, increased mobility and flexibility within the labour force, the development of knowledge through science, technological advances, greater investment in physical capital, greater specialization in production and increased efficiency in the organization and management of business enterprises. The changes in these factors have a direct effect on the employment of highly qualified manpower. The reverse, however, is also true, namely that highly qualified people are in a position to influence the changes in these factors.

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(1) *"Towards Sustained and Balanced Economic Growth", Second Annual Review of the Economic Council of Canada, EC21-1, 1965.*

Indeed, an adequate supply of the services of highly qualified manpower is associated with many of the most important factors in economic growth. New knowledge, for example, "must exist in the minds of men before it can be embodied in new skills, new machinery, new products and new processes. In order to maintain a high potential for technological change, Canada must have an adequate supply of scientific and technical manpower to serve as a basic source of invention and innovation".(1)

During the last sixty years Canada has experienced a severe depression, participated in two wars, undergone two periods of post-war adjustment and a series of mild economic fluctuations. Nonetheless overall economic activity has exhibited a strong upward trend: the Gross National Product has increased from $5.2 to $62.1 billion at current prices between 1926 and 1967, which is an average annual growth rate of 6.2%. Canada's real economic growth has been and is impressive; the value of the GNP at constant prices increased at a rate of 3.5% per year between 1926 and 1961. During the post-war period 1945-67, gross national expenditure increased from $15.2 to $37.0 billion (at constant 1949 dollars) which represents an average annual rate of growth of 4.3%.

At the same time the stock of physical capital has about doubled. From 1926 to 1961 Canada's physical capital stock increased from $48.0 to $102.0 billion (at constant 1957 dollars) and business gross fixed capital formation rose from $1.5 to $6.1 billion annually. (2) The increase in business gross fixed capital formation has continued throughout the sixties.

The trend in the industrial distribution of gross domestic product is a useful economic indicator against which to analyse different occupational mixes in producing a given output. Thus the manpower implications of a given national growth rate will vary according to the industrial sectors in which economic expansion is concentrated. The industrial composition of gross domestic product has changed greatly over the last forty years (Table 1.1). There has been a general decline in the relative share of the primary sector, especially in agriculture. The latter's share in gross domestic product declined from 17.2% in 1926-28 to 5.2% in 1965-67.

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(1) *"The Challenge of Growth and Change", Economic Council of Canada, Fifth Annual Review, page 44, 1968.*

(2) *"Canada's Economic Growth", by T. M. Brown; a study prepared for the Royal Commission on Health Services, Queen's Printer, Ottawa, 1964, pages 198-99.*

TABLE 1.1

GROSS DOMESTIC PRODUCT[a] IN CANADA, 1926-1967
By Industry and for Selected Years

Percentages

Industry	1926-28	1936-38	1946-48	1956-58	1965-67
Agriculture	17.2	10.5	12.3	6.2	5.2
Forestry	1.3	1.4	2.3	1.4	1.0
Fishing and Trapping	0.8	0.5	0.6	0.3	0.3
Mining, Quarrying, Oil Wells	3.3	6.6	3.7	4.2	4.1
Manufacturing	22.0	24.3	27.5	27.5	25.7
Construction	4.2	3.1	4.6	6.6	6.0
Transportation, Communication and Utilities	12.9	12.7	11.7	12.3	11.9
Trade	12.1	13.3	14.0	13.9	13.5
Finance, Insurance, Real Estate	9.7	10.2	7.2	9.3	10.0
Public Administration and Defence	3.4	5.0	5.4	6.8	7.0
Service	13.1	12.4	10.7	11.5	15.3
Total	100.0	100.0	100.0	100.0	100.0

(a) G.D.P. at factor cost

Source: National Accounts, Income and Expenditure, 1926-56; 1962 and 1967; Table 21. Dominion Bureau of Statistics.

The relative contribution of the other economic sectors has changed more slowly: there is a moderate upward trend especially in public utilities, mining and the service industry.

A steady increase in population is one of the factors making for increases in productive resources and it can make an important contribution to economic growth. The total population of Canada was 20 million in 1966 compared to 5.4 million in 1901, an increase of about 400% in less than 70 years. The rate of growth of the Canadian population has been one of the highest of the developed countries of the western world but has not always been even: between 1931 and 1961 average annual growth rates fluctuated between 2.6% for the decade 1951-61 and 1.1% for 1931-41. In addition to the increase in the total population, sex and age characteristics are of interest from a manpower point of view given the difference in labour force participation rates between sex and age groups. Since 1931 there has been a gradual increase in the relative size of the female population, reaching almost 50% of total population in 1966, (Table 1.2).

TABLE 1.2

CANADA'S POPULATION, 1931-1966
Growth and Selected Characteristics

Year	Population	Women as Percentage of Total Population	Population Aged 15 and Over as % of Total Population	Net Immigration as % of Inter-censal Growth
	'000	%	%	%
1931	10,377	48.2	68.3	
				-8.1
1941	11,507	48.7	72.1	
				7.9
1951	14,009	49.4	69.5	
				25.6
1961	18,238	49.4	65.9	
				14.6
1966	20,015	49.8	67.1	

Source: Census of Canada, 1931-61, Census Division, Dominion Bureau of Statistics.

The share of the population of labour force age (15 years and over) which stood in 1941 at a high of 72.2% as a result of the low level of family formation and births during the depression years, declined to 65.9% in 1961 as a result of the increase in the birth rate in the years following the war. Since 1961 this trend has reversed, and the population 15 years and over has increased its share of the total population in 1966, having been thrown into greater prominence by the more recent decline in the birthrate.

Immigration has been an important source of the growth of the Canadian population although migrant flows have fluctuated in response to changing economic conditions in Canada and abroad, and to changes in Canada's immigration policy. Between 1931 and 1966 the contribution of migration to Canada's inter-censal population growth has varied from -8.1% for the decade 1931-41 to a high of 25.6% during the decade 1951-61 when the contribution of apparent net immigration (immigrants less emigrants from Canada) was larger than in any other inter-censal period in Canada's history except 1901-1911. During the recent period 1961-66, net immigration has comprised a more modest one-seventh of overall population growth.

Canada's labour force comprised 6.5 million workers in 1961 compared to 3.9 million in 1931, having grown at an average annual growth rate of 1.7%. Like population, labour force growth has not been steady during inter-censal periods: it has varied between a high of 2.0% in 1951-61 and a low of 1.4% in 1931-41. Between 1961 and 1966 the civilian labour force has increased, according to labour force survey data, at a rate of 2.6% per year.

In 1961 there were 1.8 million women in the labour force. Women have comprised a steadily increasing proportion of the labour force from a low of 13.3% at the turn of the century to 27.3% in 1961. This trend towards greater female participation became stronger after the second world war when a wide variety of socio-economic factors including improved education, changing attitudes towards the employment of married women, improved household technology and the expansion of the service sector (offering a wider variety of jobs to women) stimulated a sharp increase in the female participation rate.

The overall male participation rate has declined since 1931, partly because of the growing tendency for an increase in the length of formal education and its extension to more people, and a combination of early retirement, an increase in pension plans, and shortage of employment opportunities for older workers which has induced many men to withdraw from the labour force upon reaching retirement age. Nonetheless, in 1961, the overall participation rate for males was more than two and a half times that of females, (Table 1.3).

TABLE 1.3

CANADA'S LABOUR FORCE, 1931-1961
Growth and Selected Characteristics

Year	Labour Force [a]	Women as % of the Labour Force	Participation Rates [c]	
			Male	Female
	'000	%	%	%
1931	3,908	17.0	87.5	19.6
1941 [b]	4,498	18.5	85.8	20.7
1951	5,277	22.0	83.8	24.0
1961	6,458	27.3	77.7	29.5

(a) 15 years and over

(b) Includes persons on active service on 2nd June, 1941.

(c) Labour force as a percentage of population 15 years and over.

Source: Census of Canada, 1931-1961

The trends in the industrial distribution of the labour force are broadly similar to those of the economic structure discussed above. One of the most noticeable features is the decline in importance of the primary sector whose share of the labour force fell from about one-third to one-seventh between 1931 and 1961 (Table 1.4). The decline of the primary sector is concentrated in agriculture which experienced a 55% decrease in its labour force in the period 1931-61. Thus between 1931 and 1961 the primary sector became the least important of the three sectors in terms of its share of the labour force. The share of the secondary sector increased from 25.5% in 1931 to 31.8% in 1961. Within this sector, manufacturing increased its share throughout the period comprising 18.5% and 23.4% of total labour force in 1931 and 1961 respectively.

TABLE 1.4

LABOUR FORCE[a] 1931-1961
By Industry Division

Percentages

Industry	1931	1941	1951	1961
Primary	32.9	31.5	21.4	14.3
Agriculture	28.6	25.8	15.9	10.1
Forestry	2.5	2.3	2.5	1.7
Fishing and Trapping		1.2	1.0	0.6
Mining	1.8	2.2	2.0	1.9
Secondary	25.5	28.8	33.9	31.8
Manufacturing	18.5	23.0	26.0	23.4
Electricity	0.6	0.6	1.2	1.1
Construction	6.4	5.2	6.7	7.3
Tertiary	37.3	38.6	43.4	51.4
Transportation & Communication	7.1	6.4	7.7	7.2
Trade	9.9	11.1	13.6	14.6
Finance and Real Estate	2.4	2.1	2.8	3.6
Service	17.9	19.0	19.3	26.0
Not Stated	4.3	1.1	1.3	2.5
Total	100.0	100.0	100.0	100.0

(a) Not including Armed Forces.

Source: "Manpower in Canada 1931-1961", N.M. Meltz, Department of Manpower and Immigration, 1969.

The fastest growth occurred in the tertiary sector with the result that by 1961, 50% of the labour force was employed in this sector. Within the tertiary sector, the service, trade and finance industries all grew at a roughly comparable rate between 1931 and 1961. By 1961, the service industry, comprising 26.0% of the total labour force, replaced manufacturing, (23.4%), as the largest single industry.

These changes in industrial distribution are also reflected in the distribution of occupations within the labour force. The greatest changes

in occupational distribution in the last thirty years have occurred in the relative shares of primary sector workers and 'white-collar' workers. The share of the primary occupations declined from 32% to 13% between 1931 and 1961. This is a consequence of the decline in agricultural workers during the period from 1.1 million to 600 thousand. Service workers and manual workers have only moderately increased their share of the total labour force between 1931 and 1961. They remain however an important group of occupations and together comprised 45.7% of the labour force in 1961. The 'white-collar' occupations, by contrast, increased their share from 24% to 39% of the total of all occupations, (Table 1.5). It is the rapid increase in highly qualified manpower within 'white-collar' occupations which is the concern of this report. In Chapter 2 the growth of this group is described in detail.

TABLE 1.5

CANADIAN LABOUR FORCE, 1931-1961
By Occupational Groups

Percentages

All Occupations	1931	1941	1951	1961
White Collar	24.4	25.2	32.5	38.6
Proprietary and Managerial	5.6	5.4	7.5	7.9
Professional	6.1	6.7	7.4	10.0
Clerical	6.6	7.2	10.9	12.9
Commercial and Financial	6.1	5.9	6.7	7.8
Manual	33.8	33.4	37.6	34.9
Manufacturing and Mechanical	11.5	16.0	17.4	16.4
Construction	4.7	4.7	5.6	5.3
Labourers	11.3	6.3	6.7	5.4
Transportation & Communication	6.3	6.4	7.9	7.8
Service	9.3	10.5	8.6	10.8
Personal	8.3	9.3	7.3	9.3
Protective and Other	1.0	1.2	1.3	1.5
Primary	32.5	30.6	20.1	13.1
Agriculture	28.8	25.8	15.9	10.2
Fishing, Trapping, Hunting	1.2	1.2	1.0	0.6
Logging	1.0	1.9	1.9	1.3
Mining and Quarrying	1.5	1.7	1.3	1.0
Not Stated	--	0.3	1.2	2.6
Total	100.0	100.0	100.0	100.0

-- = Less than 0.1%

Source: "Manpower in Canada 1931-1961", by N.M. Meltz, Department of Manpower and Immigration, 1969.

CHAPTER 2

CHARACTERISTICS OF HIGHLY QUALIFIED MANPOWER IN CANADA

I. Concepts and definitions

In the first chapter highly qualified manpower was described in very general terms. No attempt was made to restrict the scope of the term "highly qualified" to a single concept. There is in fact no convenient definition upon which one can draw for the purposes of this report. "Highly qualified" is a term that has come into international usage and is generally understood to be sufficiently flexible to allow for the inclusion of high level manpower who are not highly qualified through formal educational attainment.

Four main groups within the Canadian labour force can be identified as highly qualified manpower depending upon the criteria specified. These groups range from that suggested by the narrowest definition to the widest and are as follows:

(1) Those who possess a university degree or its equivalent can be said to be "highly qualified" in a formal sense. One advantage of this definition is that it is possible to locate and describe this type of manpower. According to the 1961 Census of Canada, there were 280 thousand university graduates in the Canadian labour force in 1961. This is equivalent to 4.3% of the entire labour force.

(2) The professional and technical occupational group as given in the census can also be regarded as highly qualified. In 1961, 629 thousand people were in the professional and technical group. This corresponds to 10% of the labour force. While only one-third of those included in these occupations were also university graduates, a further 15% had undertaken some university education.

(3) There are many high level occupations outside the professional and technical class which are of equal economic and social importance. The largest concentration of this high level manpower is in the managerial category. Managers who are in small business enterprises (e.g. managers of tobacco shops, corner stores, etc.) should probably be excluded since it is inappropriate to group them with managers of large industrial corporations and commercial enterprises. Unfortunately, there is no body of

data which allows one to separate out managers by the size of the establishment in which they are employed; however, census "class of worker" data can be taken as a rough guide to size of establishment. Those who are "self-employed" are generally owners of small businesses while those who are "employed" might be assumed to be managers of larger-scale establishments. Under this definition, 278 thousand out of the 538 thousand "managers" in 1961 might be classed as managers of larger-scale enterprises and might also be said to form part of the resources of highly qualified manpower. This group, together with the professional and technical occupations, accounts for about 15% of the labour force.

(4) The widest possible definition of highly qualified manpower would include all those in the labour force who have some type of education or training which would qualify them for a specific occupation. Unfortunately information on those who would fall under this definition is very poor. An attempt was made by the Dominion Bureau of Statistics in 1966 to survey all those who had received vocational and technical training in the labour force. The survey showed that nearly one-quarter (23.6%) of the Canadian labour force had taken at least one course of technical and vocational training in addition to general education. University degrees were not considered to be vocationally oriented although some (e.g. dentistry, medicine) clearly are. If they were included, the percentage of "qualified manpower" would rise to about 30% of the labour force. It is not possible to say, however, on the basis of this survey, how many of those who received specific training were actually engaged within the occupation for which that training was relevant.

We are not attempting in this report to prescribe rigid limits to the resources of highly qualified manpower in Canada. Our emphasis is not on trying to establish definitions or numbers but on analysing the most important characteristics of manpower in the occupations for which sound information is available. The main purpose of the report is to prepare the ground for more detailed studies of highly qualified manpower in Canada - its future development, utilization and economic contribution. Insofar as we rely on any definition of highly qualified manpower in this and the following chapters we rely on a combination of definitions (1) consisting of university graduates and (2) consisting of the members of the professional and technical category.

II. Professional and technical manpower

One of the basic sources of information on highly qualified manpower is the Census of Canada. In the remainder of this chapter, the aim is to provide a background to our treatment of particular occupations using census material. In order to illustrate some of the salient characteristics of highly qualified manpower we thus begin by considering the professional and technical census occupations.

One of the most striking characteristics of Professional and Technical occupations is their rapid rate of growth. The employment of professionals in Canada has grown faster than that of any other type of manpower in the last twenty years and very much faster than total employment, (Figure 2.1).

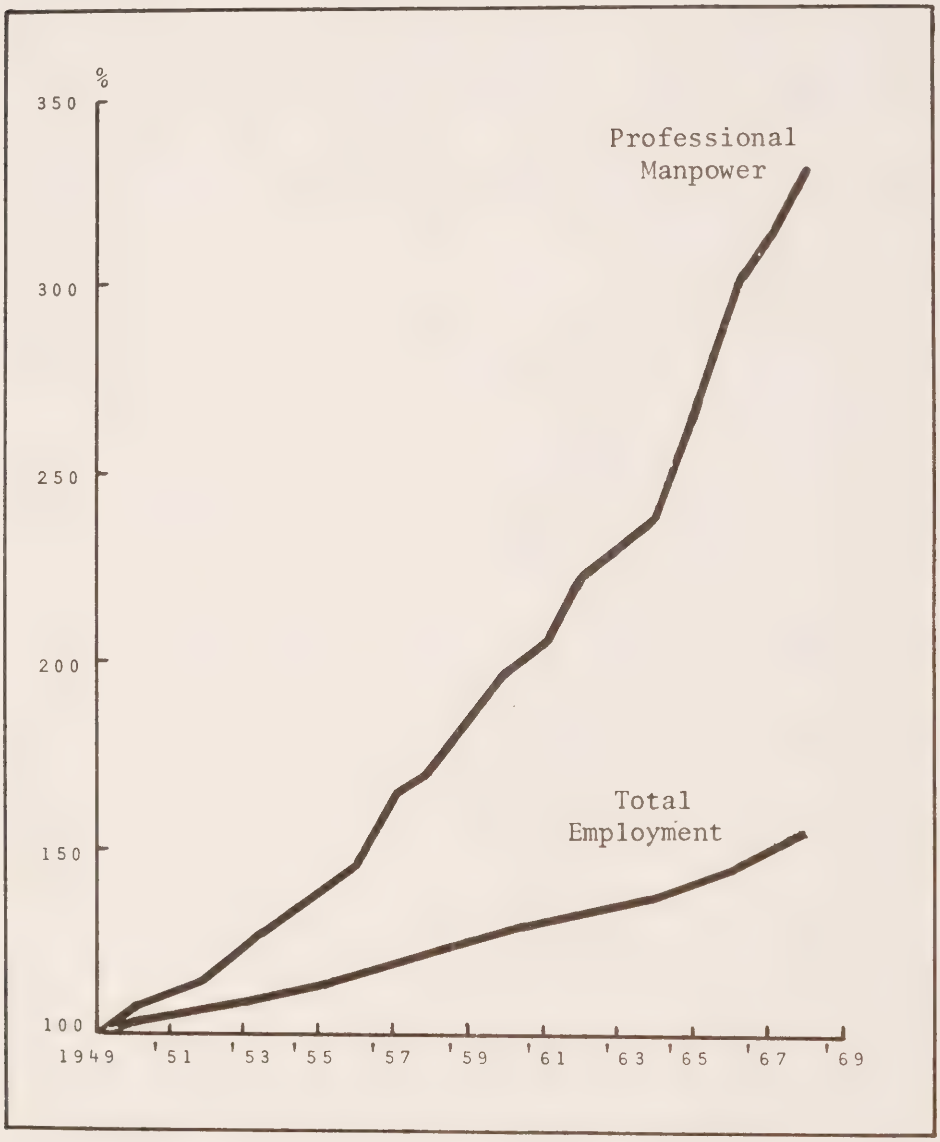
The growth of this class of occupations is an indication of the extent to which the increased complexity of the modern industrial state has intensified the need for highly qualified people. Between 1941 and 1961 professionals increased from about 288 thousand to 628 thousand, or at an annual rate of growth of 4% compared with a 1.9% per annum rate of growth for the employed labour force as a whole. 10% of all Canadian workers were classified as professional and technical in 1961 compared with 6.7% in 1941. Since 1961 the rate of growth of professionals in the labour force has been more than double that of the labour force as a whole.

Some professional occupations have expanded faster than others. Between 1941 and 1961 engineers increased more rapidly than any other occupation, at an average rate of nearly 5% a year. Within the engineering group civil engineering expanded most rapidly at 5.5% per annum. Health professionals increased at the rate of 3.9% a year; nurses, 4.3% and dentists, 1.9% being the fastest and slowest growing constituents of this group. The positions change slightly on the basis of the shorter time period 1951-61. In that decade, teachers and health professionals expanded more rapidly than any other group at 5.5% and 4.9% respectively. The growth rate of engineers was 4.1% a year.

Professionals are usually salaried employees rather than self-employed, (Table 2.1). Certain professionals are however, self-employed. They are those whose occupations bring them directly in contact with the rest of the population and for whose services a fee is charged. For example, in Canada, in 1961 nearly two-thirds of all physicians and surgeons were "self-employed" in fee-paying practices. One-third of the architects were self-employed. Computer programmers, by contrast, were entirely "employed". 95% of all the professionals specified in Table 2.1 were employees, compared with 80% of the labour force as a whole.

FIGURE 2.1

TOTAL EMPLOYMENT AND PROFESSIONAL MANPOWER IN CANADA 1949-68 (1949=100)



Source: Annual Labour Force Survey; special tables 2 and 3(c).

TABLE 2.1

HIGHLY QUALIFIED MANPOWER IN CANADA, 1961
By Selected Occupations and by Labour Force Status

Percentages

Occupation	Employees	Self-Employed	Total[a]
Civil Engineers	93.4	6.6	100.0
Mechanical Engineers	97.6	2.3	100.0
Industrial Engineers	97.6	2.3	100.0
Electrical Engineers	98.3	1.7	100.0
Mining Engineers	93.0	7.0	100.0
Chemical Engineers	98.6	1.4	100.0
All Engineers	95.9	4.1	100.0
Chemists	98.2	1.7	100.0
Geologists	94.4	5.6	100.0
Physicists	98.1	1.9	100.0
All Physical Scientists	97.3	2.7	100.0
Biological Scientists	99.0	1.0	100.0
Veterinarians	48.2	51.6	100.0
Physicians and Surgeons	38.7	61.3	100.0
Professors and College Principals	99.2	0.2	100.0
Architects	63.1	36.8	100.0
Actuaries and Statisticians	99.2	0.8	100.0
Economists	94.2	5.6	100.0
Computer Programmers	100.0	-	100.0
Social Welfare Workers	99.2	0.7	100.0
All Professionals Specified	95.2	4.7	100.0

(a) Includes unpaid family workers

Source: Census of Canada, 1961; part I, Vol. III.

Canada draws heavily on other countries for its professional manpower. There is a greater proportion of foreign-born in the professional group than in the rest of the labour force. Between 1953 and 1963 slightly more than 80 thousand professional and highly skilled technical workers entered Canada from other countries. The largest portion of these workers, accounting for three-fifths of the total, were from the United Kingdom. The second largest group was from the United States. Professional manpower has become a large component of immigrant manpower, 24%. In some occupations, the size of the contribution of other countries to Canada's professional manpower has been very large. In 1961 nearly one-half of all the architects in Canada were foreign-born, (Table 2.2).

TABLE 2.2

HIGHLY QUALIFIED MANPOWER BY OCCUPATION GROUP,
By Place of Birth and Date of Immigration

Percentages

Occupation	Born in Canada	Immigrated Before 1946	Immigrated 1946-1961	Total %
Architects	57.5	8.0	34.5	100.0
Physical Scientists	67.6	6.6	25.8	100.0
Engineers	67.0	7.8	25.2	100.0
Computer Programmers	75.6	4.4	20.0	100.0
Physicians and Surgeons	74.7	6.1	19.2	100.0
Professors and College Principals	76.4	7.6	16.0	100.0
Actuaries and Statisticians	77.6	7.2	15.2	100.0
Biological and Agricultural Professionals	80.1	5.9	14.0	100.0
Other Professional and Technical Workers	82.9	6.1	11.0	100.0
Total Professional and Technical Workers	81.0	6.3	12.7	100.0
All Occupations, Labour Force	78.6	9.0	12.4	100.0

Source: Census of Canada, 1961.

Twenty-five percent of all physicians in Canada came from abroad and this proportion is increasing according to recent evidence. 25% of the physical scientists and engineers working in Canada had entered the country as landed immigrants between 1941 and 1961 compared with 12.4% of the whole labour force.

Another measure of the importance of foreign-born manpower to the supply of professionals is the ratio of immigrants to those graduates in the same subject or discipline from Canadian universities. Between 1953 and 1963 the number of engineers entering Canada from abroad was equal to 73% of the number graduating from Canadian universities during the same period. The proportion for physicians and surgeons was 53% and that for architects, 141%.

Professional manpower is typically university educated (Table 2.3). In 1961, only 4.3% of the Canadian labour force possessed a university degree compared with 57% for the major groups of the professional occupations.

In 1961, the proportion of degree-holders was much higher in some occupations than in others; only 45% of industrial engineers possessed a university degree whereas 90% of physicists were graduates. Although 43% of those professionals specified in Table 2.3 did not have a university degree, nearly two-thirds had received some education at university level.

The earnings of highly qualified manpower greatly exceed those of the average employed person in the labour force. Most male professionals in 1961 earned nearly twice as much as the average employed male in 1961 (Table 2.4). Nevertheless, there were significant disparities between the earnings of professionals as is evident in Table 2.4.

Chapters 1 and 2 have presented a static and rather general picture of Canada's resources of highly qualified manpower. Chapter 3 introduces a more dynamic element into our consideration of highly qualified manpower in Canada as it examines different flows of manpower into and out of the Canadian labour force.

TABLE 2.3

HIGHLY QUALIFIED MANPOWER IN CANADA, 1961
By Occupation, by Highest Level of Education

Percentages

Occupation	No University Education	Some University Education	University Degree	Total
Civil Engineers	9.2	9.8	81.0	100.0
Mechanical Engineers	22.8	11.2	66.0	100.0
Industrial Engineers	41.4	13.9	44.7	100.0
Electrical Engineers	15.4	10.7	73.9	100.0
Mining Engineers	10.0	9.6	80.4	100.0
Chemical Engineers	5.3	7.7	87.0	100.0
All Engineers	17.1	10.7	72.2	100.0
Chemists	18.8	14.9	66.3	100.0
Geologists	4.5	10.1	85.4	100.0
Physicists	4.9	4.3	90.8	100.0
All Physical Scientists	14.5	12.4	73.1	100.0
Bio. Scientists	7.5	11.2	81.3	100.0
Veterinarians	7.4	7.2	85.4	100.0
Physicians and Surgeons	1.7	2.7	95.6	100.0
Professors & College Princ.	6.5	9.1	84.4	100.0
Architects	12.1	9.1	78.8	100.0
Actuaries and Statisticians	49.6	13.9	36.5	100.0
Economists	29.4	12.2	58.4	100.0
Computer Programmers	49.8	21.8	28.4	100.0
Social Welfare Workers	51.9	17.4	30.7	100.0
Total Professionals Specified	29.8	13.0	57.2	100.0
All Occupations	91.2	4.5	4.3	100.0

Source: Census of Canada, 1961.

TABLE 2.4

EARNINGS INDEX OF HIGHLY QUALIFIED MANPOWER, 1961
By Selected Occupations

Index Numbers

Occupation	Males[a]
Civil Engineers	193
Mechanical Engineers	192
Industrial Engineers	188
Electrical Engineers	199
Mining Engineers	209
Chemical Engineers	207
All Engineers	196
Chemists	168
Geologists	198
Physicists	202
All Physical Scientists	181
Biological Scientists	163
Veterinarians	173
Professors and College Principals	193
Architects	182
Actuaries and Statisticians	174
Economists	190
Computer Programmers	145

(a) Average for all males in all occupations in 1961 = $3,679 = 100

Source: Census of Canada, 1961.

CHAPTER 3

FLOWS OF HIGHLY QUALIFIED MANPOWER

I. Introduction

Canada's total resources of highly qualified manpower are continuously increased or diminished by a number of different flows into and out of the Canadian labour force. The magnitude and direction of these flows are affected by such diverse elements as the state of the labour market at home and abroad, immigration laws and investment in higher education. Some flows, such as immigration, are more readily adjustable in the short-term, while others, such as the output of the educational system can only be altered gradually. The most significant potential sources and losses of highly qualified manpower in Canada are shown in Figure 3.1. Graduates from the domestic education system and the inflow of professional and scientific personnel from other countries into Canada are the major sources of new manpower. General attrition, i.e. deaths, retirements, etc. and the emigration of the employed members of the labour force are the prime losses from the system. The importance of each flow has varied over time as well as between occupations. In this section, some general trends in the flows of highly qualified manpower will be investigated, and then flows into certain occupations will be considered in more detail.

Graduates from the domestic education system provide the largest source of highly qualified manpower. While there are some professions such as medicine in which the number of immigrants at times has exceeded the number of Canadian graduates, on the whole, total graduations have exceeded the immigration of professionals into the country (1) (Figure 3.2).

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(1) *The graduation and immigration figures are only a measure of potential supply. Not all graduates enter the stock of highly qualified manpower and many immigrants who state their intended occupation as a professional one may not in fact qualify for employment in that profession in Canada.*

FIGURE 3.1

FLOWS OF HIGHLY QUALIFIED MANPOWER

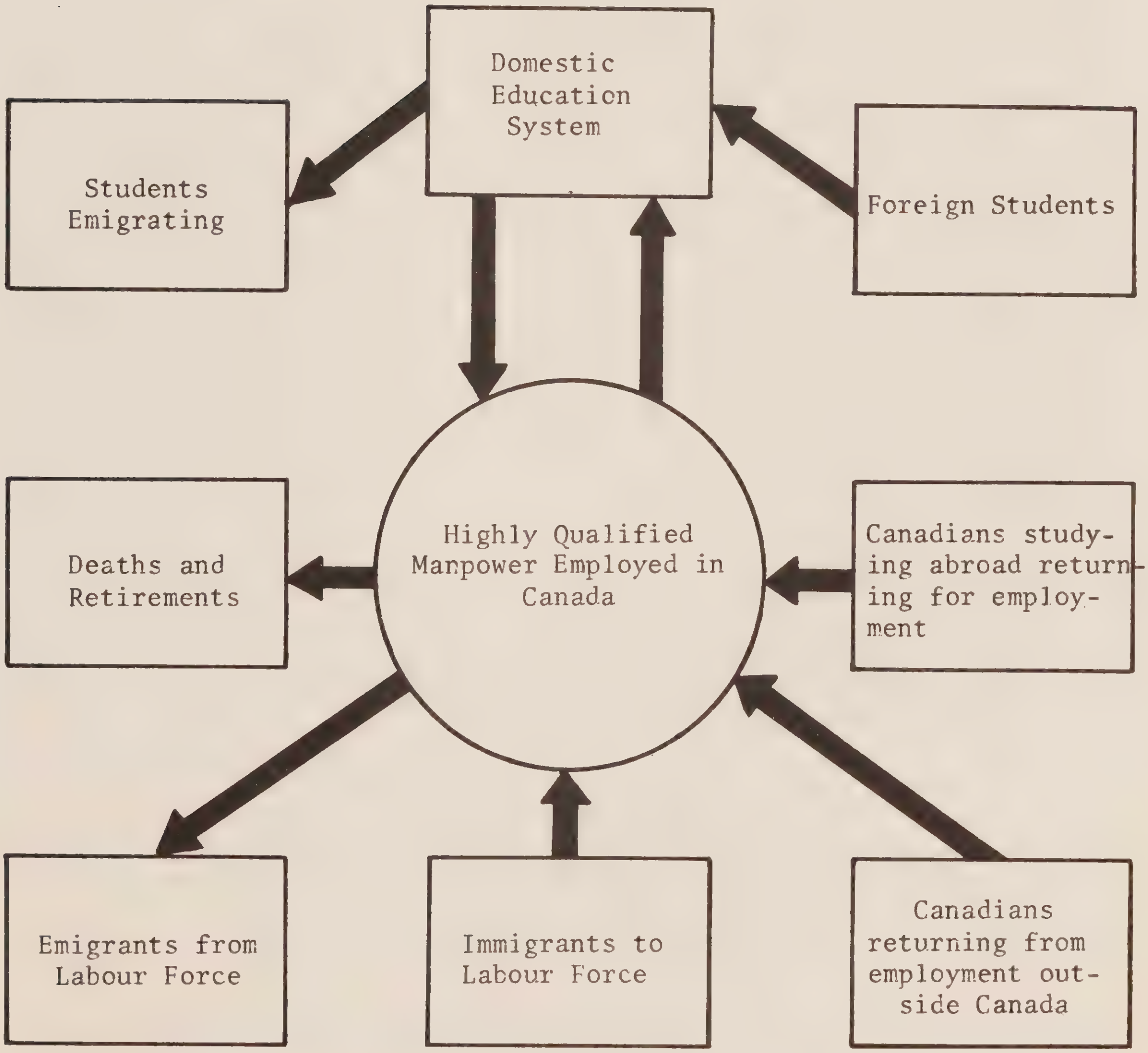
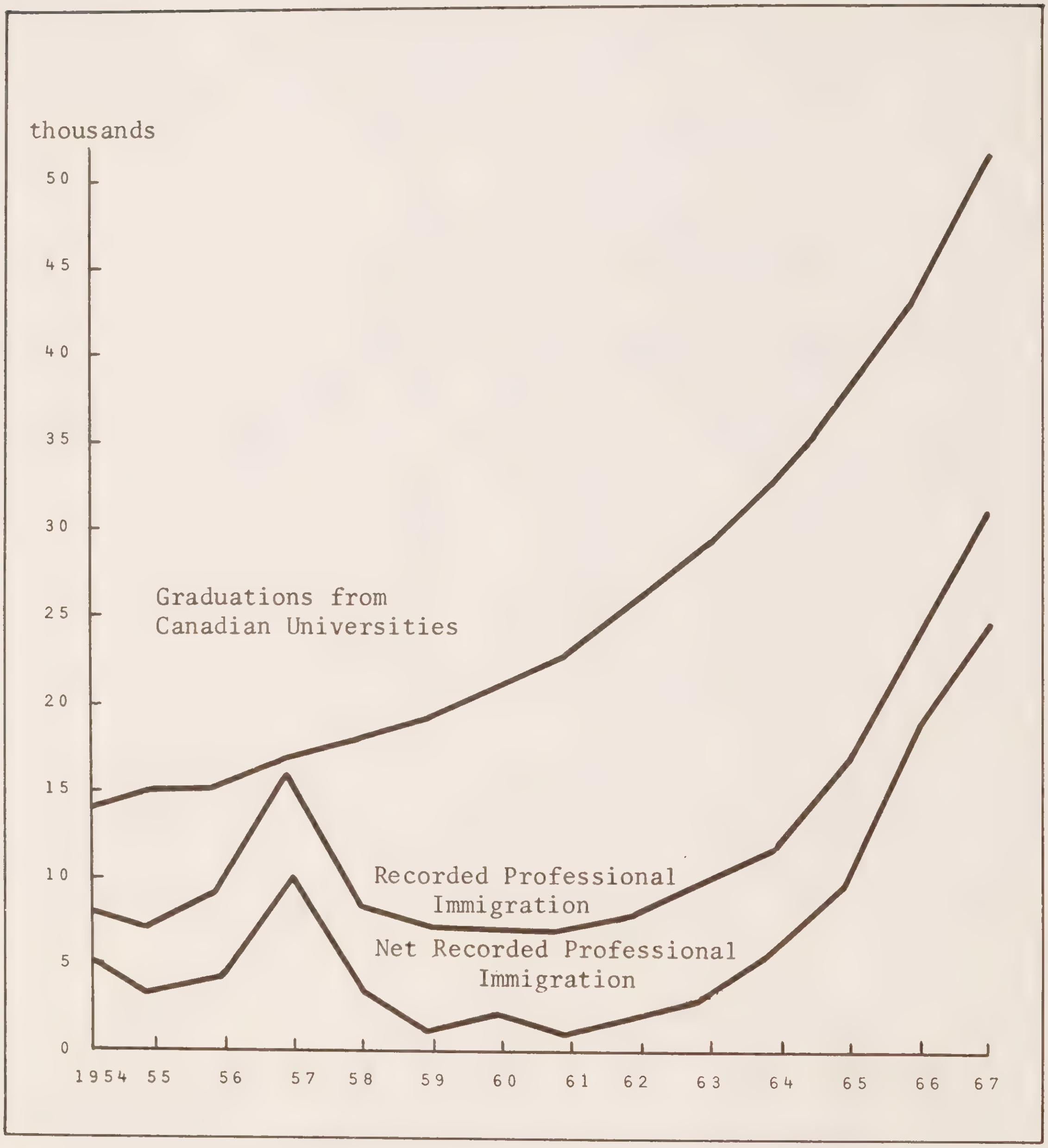


FIGURE 3.2

GRADUATIONS, PROFESSIONAL IMMIGRATION,
AND NET PROFESSIONAL IMMIGRATION(a), 1954-1967



(a) Net Professional Immigration = Professional Immigration into Canada, less the emigration of professionals to the United States.

Source: Appendix Table I.1

Immigration as a proportion of graduations has varied considerably over time. In 1954, immigration of professionals was equal to 60% of the number of people graduating from Canadian universities. Net recorded immigration of professionals, i.e. immigration less emigration to the United States was 35% of the domestic graduations. In 1961, the respective proportions were 29% and 6%. However, since 1961 immigration has increased considerably: in 1966 immigration was 53% of graduations; net immigration, 44%.

The growth of higher education has accelerated through the 1960's. University and college undergraduate degree courses have expanded at a remarkable rate as enrolments have tripled from some 73 thousand in 1957 to 213 thousand in the academic year 1966-67 and 237 thousand in 1967-68. This expansion of enrolments has foreshadowed a rapid increase in graduate output. For example, in 1950, 18 thousand graduated from Canadian universities with a bachelor or first professional degree. In 1960 there were 21 thousand graduates and in 1967, almost 44 thousand. There has been an even greater growth in post-graduate degrees. Master's degrees in 1967 were 268% greater than they were in 1950, doctorate degrees exceeded the 1950 number by 249% while B.A. degrees had expanded by 142%.

The rapid rise in enrolments in higher education followed a wave of expansion in Canada's secondary schools where enrolments more than tripled from the beginning of the 1950's to the 1965-66 school year (1). Part of this expansion can be explained by increases in the size of the relevant age-group and part by rising participation rates. These two factors have been of about equal importance in the growth of secondary enrolment during the 1950's and 1960's, and it appears that they will continue to be equally important during the next ten years (2).

At the university level the largest portion of the increase is accounted for by increased participation rather than population increases in the relevant age-group. Between 1956 and 1966, full-time enrolment rose by 180% while the 18-24 age-group only expanded by 30%. "This implies that less than one-fifth of the rise in the number of students can be 'explained' by population growth, while over four-fifths was due to higher participation." (3).

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(1) Illing and Zsigmond, "Enrolment in Schools and Universities, 1951-52 to 1975-76", Staff Study No. 20, Economic Council of Canada, page 21.

(2) Ibid., page 21.

(3) Ibid., page 21.

A marked characteristics of this expansion of higher education has been the differences in growth rates of particular disciplines. The distribution of students a decade ago is quite different from the distribution today (Figure 3.3).

Expansion in the fields of pure science and education has been striking. Enrolments in these fields have increased by about 450% between 1957 and 1967. Arts enrolments have also enlarged greatly from 26 thousand in 1957 to 94 thousand in 1967. Lack of growth, however, is apparent in the fields of medicine and engineering. Only three hundred more students were enrolled in medicine in 1967 compared to 1957, an increase of 7%. In engineering in 1967 enrolments were 18,498 compared to 13,050 ten years previously, an increase of 42%. A similar trend in growth is found in the number of students receiving bachelor and first professional degrees (Appendix Tables I.2, I.3).

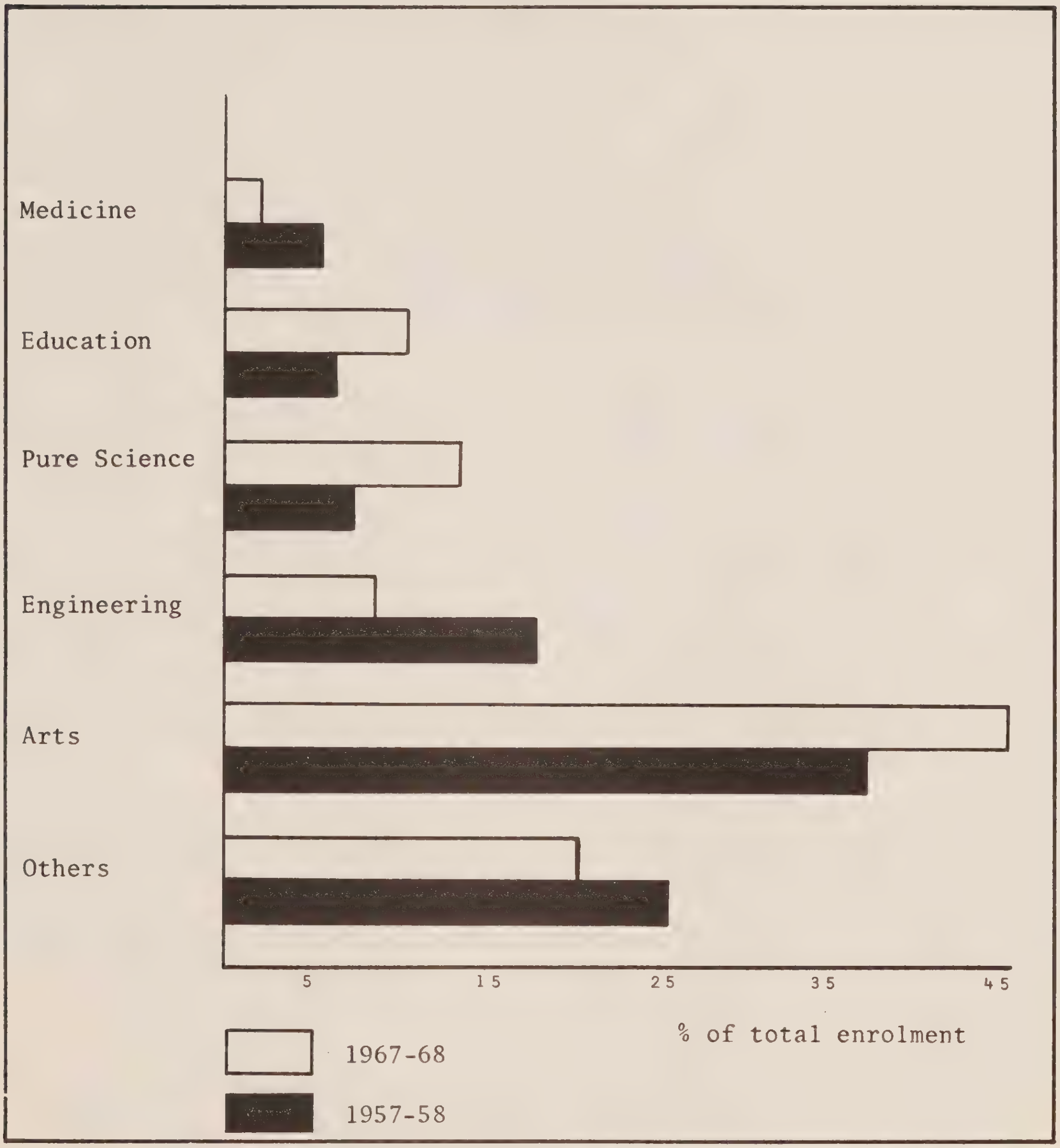
A different pattern of growth emerges from an analysis of post-graduate degrees (Appendix Table I.4). The largest percentage increase from 1957 to 1967 in both Master's and Doctoral graduations has been in engineering. The former was 403% greater in 1967 than 1957 and the latter 741%. The proportion of engineering graduates to the total graduates at a Doctoral level increased from 4% in 1957 to 13% in 1967. This contrasts sharply with the very small growth in first degrees of engineering students.

The social sciences had the largest share of Master's degrees, while the biological and physical sciences accounted for almost 60% of all Doctorates awarded in 1967, (Appendix Table I.5). The least growth was exhibited in the biological sciences where graduations in 1967 were less than 100% greater than those in 1957 compared with an average of 170% increase for all fields.

The new supply of highly qualified manpower will tend to follow this growth pattern. However, the number of graduates by no means represents the actual domestic inflow into the stock. There are a number of leakages from the system that will tend to decrease the number of new entrants. There are a large number of foreign students who, after receiving their education in Canada, return to their home country or seek employment outside Canada. In 1967 there were some 12,900 foreign students enrolled in Canadian universities. This represents approximately 5.6% of total enrolments. While we know that many of these students emigrate after graduation, at present, we have no data on just how large this group might be. Similarly many Canadian students choose, rather than enter the Canadian labour force after graduation, to seek employment outside of Canada. Others prefer to continue their studies either within the domestic system or outside the country.

FIGURE 3.3

PERCENTAGE DISTRIBUTION OF FULL-TIME UNIVERSITY
UNDERGRADUATE ENROLMENT, 1957-58, 1967-68
By Degree Course



Source: Survey of Higher Education, D.B.S. Cat. No. 81-204.

Eventually, some of these out-migrants return and add to the flow into the system. Again we have no estimates of the magnitude of these inflows. We do, however, have some idea of the stock from which this flow might come. In 1967 there were some 12 thousand Canadians studying in universities in the United States and another 600 in Britain. Growth in enrolments at universities in the U.S. has not matched the rapid increase in Canadian ones. In the former, enrolments in 1966-67 were 166% greater than in 1952-53. In Canada, total enrolments were 266% greater over the same period. Interestingly enough, however, the pattern of growth by field of study was similar at home and abroad. For Canadians in the United States, as in Canada, the proportion studying engineering and health professions, particularly medicine, declined. Growth in the social sciences was the most striking. Enrolments in the social sciences in 1968 were five times greater than those in 1964. This rapid expansion most likely reflects a growing interest in the relatively new discipline of social science.

The flow of foreign professional manpower into Canada has grown rapidly in the last decade (Figure 3.2) - at approximately the same rate as the domestic educational system. This source of manpower has traditionally been very important to the economy as is evident by the fact that about 20% of the stock of highly qualified manpower in Canada is foreign-born. Partially as a result of the ever expanding demands in Canada for highly qualified manpower and partially because of Canada's policy of selective immigration, the flows of professional immigrants have expanded far more rapidly than flows of other types of manpower. In 1950, 4.2% of all immigrants were professional. By 1960 this percentage had increased to 14% and in 1967 was 26%. Over this 17 year period the absolute numbers of professional immigrants increased from 1,686 in 1950 to 30,853 in 1967.

While there has been an ever increasing inflow of highly qualified manpower both from the educational system and abroad, the outflow of this type of manpower, at least to the United States, (1) has been remarkably constant. The number of professionals emigrating to the U.S. has varied little in the last decade. In 1956, 5,277 professionals left Canada to take employment in the States. In 1961, 5,285 people left and in 1967 the number was 6,386. The net loss to Canada is probably less

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(1) *The only substantial data available on the outflow from the domestic stock through emigration is on immigration into the United States. Data on this flow comes from the United States Department of Justice, Immigration and Naturalization Service.*

than the figures show because residents returning to Canada from the United States are not recorded. (1)

Having considered generally the most important flows of highly qualified manpower, we next investigate some specific occupations in more detail.

II. Physicians

Of the two sources of highly qualified manpower, Canadian graduates and immigrants, Canada relied more heavily in 1968 on immigrant physicians to increase the supply of medical manpower. In the post-war period as a whole, immigrant physicians, especially those trained in the United Kingdom, have contributed greatly to the improvement in the physician-population ratio in Canada. "Out of nearly 15 thousand newly registered physicians in Canada during the years 1950-60, about one-third were immigrant physicians. Over the same years, the immigrant doctors were equal to about one-half of the total output of 9,300 graduates of Canadian medical schools." (2)

Thus, although efforts have been made to increase the supply of physicians from Canadian medical schools, the output from this source has changed little whilst the supply from abroad has increased (Figure 3.4). The share of medical education in higher education has declined over the last decade: while there has been a rapid growth in output from Canadian universities since 1960 - indeed output of first degrees has doubled in this period - the supply of medical graduates only increased by 17%.

The impact of immigration on the supply of physicians is counterbalanced to some extent by the output of physicians from Canada to other countries. The only source of information on the size of this outflow relates to emigration to the United States. Over the 18 year period 1950-1967, a total of 4,713 physicians and surgeons, whose last permanent residence was Canada, emigrated to the U.S. The average over the period was 261 with a low of 96 in 1956 and a high of 467 in 1963. (3) The

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(1) *See "Migration between Canada and the United States", by K. V. Pankhurst, printed in the Annals of the American Academy of Political and Social Science, Philadelphia, Vol. 367, pp. 53-62.*

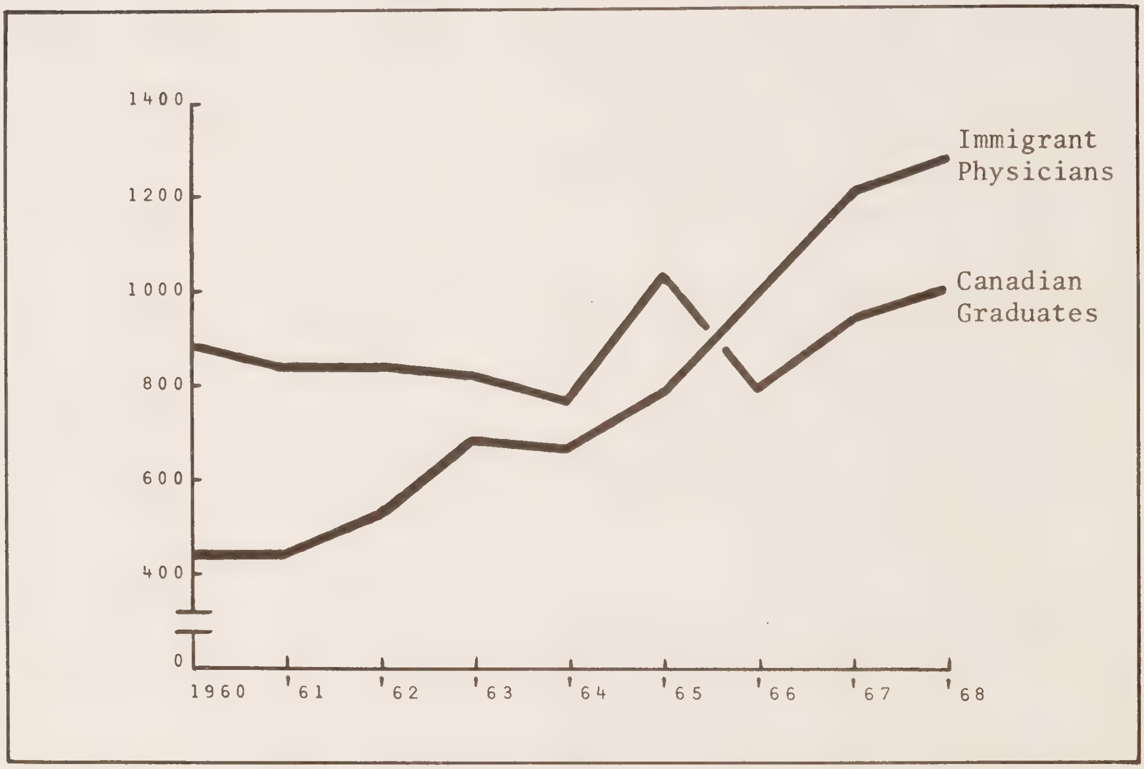
(2) *Royal Commission on Health Services, 'Medical Manpower in Canada', page 9.*

(3) *United States Department of Justice, Immigration and Naturalization Service.*

percentage of Canadian-born among the physicians emigrating south was remarkably low. In 1966, 33.4% were born in Canada while in 1967, only 27.4% were Canadian-born. (1) This would seem to imply that foreign-born physicians in Canada are more likely to emigrate than those born in this country.

FIGURE 3.4

MEDICAL GRADUATES AND IMMIGRANT PHYSICIANS, 1960-68



Sources: Health Manpower Inventory, 1969, by the Department of National Health and Welfare.

Survey of Higher Education,. D.B.S., Cat. No. 81-204.

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(1) *Scientists, Engineers and Physicians from Abroad, National Science Foundation. N.S.F 69-10.*

III. Dentists

The main sources of new entrants into dentistry are, in order of importance, Canadian dental schools and immigration. In addition, a small number of Canadians studying dentistry abroad and an almost equal number of foreign students are enrolled in Canadian dental schools. (1)

There are nine university dental faculties in Canada. Two provinces, Ontario and Quebec, have two each; Newfoundland, Prince Edward Island and New Brunswick have none, and the remaining five provinces each have one dental faculty. Three of the nine faculties are of very recent origin, namely the dental faculties at the Universities of British Columbia, Western Ontario and Saskatchewan, which first accepted undergraduate enrolment in 1964-65, 1967-68 and 1968-69 respectively. Full-time undergraduate enrolment in Canadian dental schools in 1967-68 was 1,371 compared to 993 in 1947-48. The annual growth rate between 1947 and 1967 was 1.7% compared to 5.3% for total university undergraduate enrolment and, as a result, dental schools' share of the latter declined from 1.3% to 0.6% over the period.

The trend in undergraduate enrolment in dentistry in the last two decades has been uneven. In the immediate post-war period, enrolments expanded as a result of veteran enrolment and reached a peak of 1,096 in 1948-49. Students entering dentistry declined from that year up to 1953-54 when they again began to rise from a low of 822. Enrolments in dentistry have increased continuously but slowly from 1953-54 especially when compared to enrolments in fields such as the pure and social sciences. In 1967-68, 1,371 students were enrolled in Canadian dental schools, only 549 more than eight years previously. (2)

Immigration as a source of new entrants into dentistry is increasing in importance despite the fact that professional regulations for dental licensure make it difficult for most dentists migrating to Canada to obtain a license to practice without attending a Canadian dental school for at least two years. (3) Immigrant dentists increased from 25 in 1955 to 99 in 1967. This is equal to about one-third of the first

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(1) *Average annual enrolment of Canadians in U.S. dental schools over the period 1955-56 through 1967-68 was 81, while the average number of foreign students at Canadian dental schools over the same period was 82.*

(2) *Survey of Higher Education, D.B.S., Cat. No. 81-204*

(3) *McFarlane, 'Dental Manpower in Canada', op cit., page 20.*

professional degrees granted by Canadian dental schools in the latter year compared to only one-fifth in 1960.

In 1967, 18 dentists emigrated from Canada to the United States, compared with 10 in 1966 and 21 in 1965. The average number emigrating annually, over the period 1956-1967, was 12. It is estimated that about three-fifths of all dentists emigrating from Canada go to the United States. (1)

IV. Nurses

In past years, two types of nursing school, namely hospital-sponsored and university schools of nursing, have offered a wide variety of programmes for the education and training of the professional nurse in Canada. However, in the last two years an increasing share of education and training has been taken on by technological institutes. In 1968 there were 212 schools of nursing offering basic programmes; 186 were hospital-sponsored and 26 were post-secondary educational institutions. In addition 20 university schools offered the basic Baccalaureate in nursing, and post-basic diplomas and Baccalaureates in nursing for nurses already holding the R.N. certificate. Four schools offered programmes leading to a Master's degree in nursing.

Of the five types of nursing education programmes, only the hospital diplomas and the university basic Baccalaureate are a source of new entrants into professional nursing; the other programmes afford professional nurses an opportunity to gain specialized training and improve their academic qualifications. The majority of new entrants into nursing are trained in hospital schools (Appendix Table I.6). In 1967, 96% of those attaining professional status through the two basic programmes in Canada were graduates of hospital schools of nursing.

Between 1963 and 1967 full-time enrolment and graduation in basic and post-basic university Baccalaureate programmes increased by 27.0% and 25.6% respectively and, as a result, two-thirds of new recipients of the Baccalaureate in nursing in 1967 were from post-basic programmes as compared with 55% in 1963. The university diploma certificate programme is declining in popularity. Full-time enrolments in the latter fell from 953 to 440 between 1963 and 1967. On the other hand, enrolments at the Master's level more than doubled over the same period, though there were still only 54 students in 1967. No Canadian university school offers a Doctorate programme in nursing.

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(1) Ibid., page 25; this figure is based on the years 1945 through 1961.

Large numbers of nurses enter and leave Canada each year. There has been a marked increase in the number of immigrant nurses to Canada between 1964 and 1967. In the latter year, the 4,262 immigrant nurse arrivals were more than one-half as large as the annual output of graduates from basic programmes at Canadian schools of nursing; in 1964 the proportion was one-quarter. Immigration data may overstate the contribution of foreign nurses to Canada's nursing stock, largely because some immigrants may not possess the basic qualifications prescribed by individual provincial nursing associations for licensure as registered nurses. Between 1964 and 1967 licenses issued for the first time to professional nurses from foreign countries increased from 72% to 78% of the annual number of immigrant nurses.

The United Kingdom is the principal source of Canada's foreign-born nurses. This country accounted for 38% of total immigrant nurse arrivals between 1946 and 1968; comparable figures are 23% for the Philippines and 7.0% and 6.4% for Australia and the United States respectively.

The number of nurses emigrating annually to the United States, the only country of destination for which statistics of Canadian emigration are available, and which absorbs most nurses and other highly qualified manpower emigrating from Canada, has been relatively stable, averaging 1,341 annually between 1964 and 1968. This stable emigration flow and rising immigration have combined to increase the potential contribution of net migration to Canada's nursing manpower from about 500 in 1964 to over 3,000 in 1967.

V. Lawyers

Undergraduate student enrolment in law faculties reached 5,735 in 1968-69, an increase of 664 over the previous year and more than double the 2,672 students enrolled in 1961-62. The average annual rate of growth of student enrolment between 1962-63 and 1968-69 was 11.5% as compared with 1.2% during the period 1952-53 through 1962-63. The expansion of undergraduate enrolment in law faculties is therefore a relatively recent phenomenon beginning in 1963-64 after a 16 year period of relatively stagnant enrolment since 1947-48, the peak year of the veteran enrolment when there were 2,499 undergraduates in Canadian law faculties.

The recent expansion notwithstanding, enrolment in law schools has not kept pace with the overall expansion of university undergraduate enrolment in the post-war period and as a result its share of the latter stood at 2.1% in 1967-68 as compared to 3.2% and 4.2% in 1947-48 and 1953-54 respectively. In comparison with medical school enrolment, on

the other hand, law school enrolment records look more impressive. Whereas enrolment in the former was 24% above law school in 1947-48 and 60% above in 1952-53, law school enrolments generally expanded more rapidly after that year with the result that in 1967-68 law for the first time surpassed medical undergraduate enrolment although by only 1%.

In 1967-68, 1,190 first professional degrees were granted by Canadian law schools, about 150 more than in 1966-67, compared to 649 in 1957-58 representing a rate of growth of 6.2% annually. As with enrolment, the expansion in the number of graduates is a relatively recent phenomenon, thus the 764 graduating in the veteran peak enrolment in 1949-50 was not exceeded until 1964-65 when enrolment reached 767. A total of 13.2 thousand first professional degrees in law were granted since 1950-51, 4.7% to women. Ontario's law schools conferred 40.4% of the total degrees granted, Quebec's law schools 27.1% and the Western Provinces and the Atlantic Provinces granted 24.9% and 7.6% respectively. The relatively wide differential between Ontario's and Quebec's share of graduates may appear surprising in the light of the narrow margin between these provinces' share of law professionals and is explained by the fact that graduates of the civil law faculty of the University of Ottawa are included among Ontario law graduates but practice law in Quebec.

In 1968-69 there were 97 full-time students attending graduate law courses, well below the 134 of the previous year. Graduate enrolment increased at an average annual growth rate of 5.1% between 1961-62 and 1967-68. Few students are enrolled in graduate law programmes outside of Quebec and Ontario. Graduate studies in law seem more popular with civil as opposed to common law students. Thus, between 1966-67 and 1968-69 nine-tenths of graduate enrolment were in civil law faculties.

Women comprise a relatively small though increasing share of total undergraduate law enrolment representing only 8.7% in 1968-69 as compared to 5.5% in 1962-63, the first year for which enrolment data is available by sex. The increasing trend in female participation is especially pronounced at the graduate level where females comprised 13.3% of enrolments in 1968-69 as compared to 9.0% in 1967-68 and 6.7% in 1962-63. The relative increase in female graduate law students may reflect that barriers to entry against women in some fields of law practice may result in a lower opportunity cost of graduate law studies for women compared to men. The effect of restrictive practices in the field may make teaching in a law faculty appear more lucrative as a field of specialization for women than men; and, graduate law study is fast becoming a prerequisite for teaching in law faculties. Women comprised 2.4% of the teaching staff in law in 1968-69 as compared to 1.2% in 1967-68.

Immigration as a source of new entrants has had a small effect on the stock of law professionals in Canada. In 1962, the first year for which immigration data was available, 35 immigrants specified law as their intended occupation. This number increased to 65 in 1966 and 91 in 1968 averaging 57 annually or 6.7% of first degrees granted by Canadian law faculties during the period. Immigrants comprised 10.5% of law professionals in the 1961 Census labour force.

Emigration of law professionals from Canada to the United States has been very low. The average number emigrating in each year over the period 1962-1967 was 13.

Net migration (defined as immigration minus emigration to the United States) of law professionals averaged 38 annually or 4.8% of new law graduates between 1962 and 1967. The relative contribution of immigration to the growth of the stock of law professionals may be somewhat higher than this figure suggests since some university law graduates move into fields outside of law practice. The extent to which an allowance for this factor would tend to increase the relative importance of net migration is unknown though probably small and may even be negative since, given the barriers to entry imposed by provincial law societies, immigrant law professionals may disperse to non-legal fields to a greater extent than Canadian law graduates. The requirements set by provincial law societies governing admission to the practice of law are a major deterrent to both international and interprovincial migration. These requirements, which vary between provinces, generally restrict practice to members of other Canadian provincial law societies and to practising solicitors and barristers with at least three to five years' experience in the courts of the United Kingdom and the British Commonwealth. All are required to take examinations in statutes and procedures of the host province, but the immigrant lawyers must in addition undergo a six to twelve-month period of training as an articled clerk and may be required to attend territorial sessions. Deterrents to the immigration of law professionals are most severe in Quebec where the practice of law is restricted to Canadian citizens.

VI. Scientists and Engineers

In the past decade, there has been a marked shift away from studies in the field of engineering and into the fields of the pure and social sciences. This trend is reflected in both enrolments and graduations at a first degree level. Since 1956, enrolments in the pure sciences have increased by more than 500% from 5,151 in that year to 28,568 in 1966-67. Enrolments in arts courses, which include the social sciences, were 257% greater in 1966 than in 1956. Engineering enrolment on the other hand only increased from 13 thousand to some 18 thousand (42%) in

the same time period. Different patterns of growth in other fields of study have contributed to a definite change in the distribution of students between fields. This change is particularly marked in the pure sciences and engineering (Figure 3.5). While in 1957-58, 18% of total undergraduate enrolments were in engineering, only 9% were enrolled in that field in 1967. Conversely, enrolments in the pure sciences have expanded from 7% in 1957 to 14% of the total in 1967. There are a number of reasons why these shifts have taken place over time. Student preferences towards a certain field are to a large extent influenced by the current state of the labour market in these fields. The labour market is in turn conditioned by changing economic conditions, new inventions and new explorations.

At a post-graduate level, the pattern of growth of scientific and engineering studies is quite different. At both the master's and doctorate level, graduates in engineering have increased more rapidly since 1957 than has been the case in any of the scientific fields (Appendix Table I.4). From 99 master's graduates in 1957, the number rose to 498 in 1967. Similarly in 1957 there were only 12 doctorate degrees awarded in engineering and in 1967 there were 101. This rather surprising growth is partially a result of the rather recent availability of graduate courses in this field. It is also possible that a slack labour market might induce some students who under other conditions would have taken employment to continue their studies beyond the first degree level.

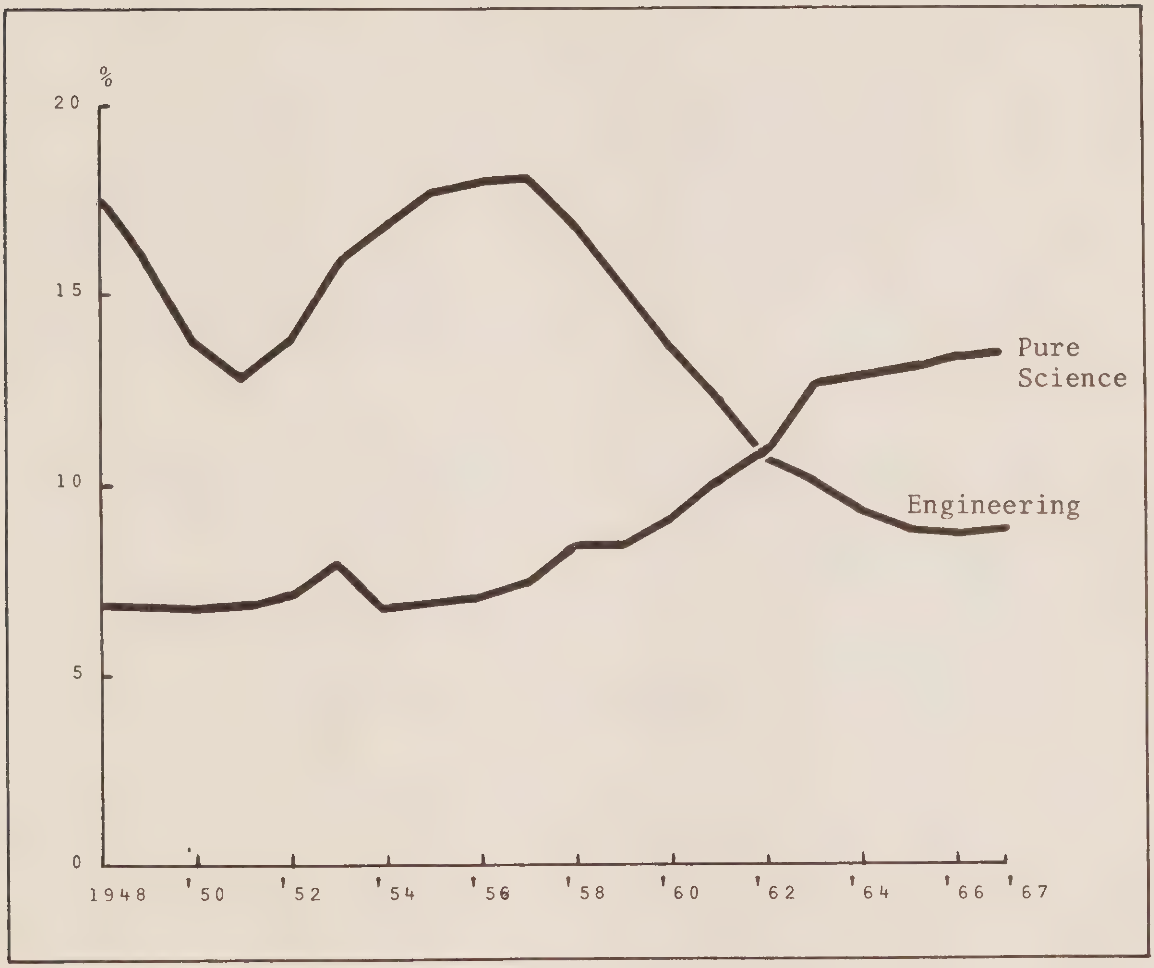
Also reflecting the relative newness of the field, post-graduate degrees in the social sciences have shown large increases in the last ten years. In 1957, 663 master's degrees were awarded in the social sciences; in 1967, 3,080 were granted.

Graduations in the biological sciences have shown the least growth as is reflected by the fact that the precentage of degrees in the biological sciences to total degrees has fallen from 14% to 9% for master's degrees and from 30% to 21% in the case of doctorate degrees, (Appendix Table I.5).

While the flow of post-graduate students from the scientific and engineering fields has greatly expanded in the last few years, this does not mean to imply that the stock of manpower in these fields has consequently been increased by the amount of this flow. One important loss to the system is that of non-Canadian students who receive their degree in Canada and then return home or go to the United States to take employment. Although we do not know the extent of this loss, the large proportion of non-Canadian in post-graduate scientific and engineering degree courses implies a high potential for loss of this manpower. In 1968, 44% of the students enrolled for a master's or doctorate in science or engineering were non-Canadian (Appendix Table I.7). If a large

FIGURE 3.5

STUDENTS ENROLLED IN ENGINEERING AND PURE SCIENCE
AS A PERCENTAGE OF TOTAL UNDERGRADUATE
ENROLMENTS, 1948-1967



Source: Fall Enrolments in Universities and Colleges, D.B.S. Cat. No. 81-204

proportion of these students take employment in Canada, then there will be a gain of manpower over the domestic supply and the cost of educating those who leave will be offset by the added productivity of those who remain.

Canadians studying science and engineering in the United States exhibit generally the same preferences as their counterparts in Canadian universities. Relatively more students have been going to the U.S. to take courses in the social sciences, while far fewer students have been going to study engineering. The increase in the social sciences between 1957 and 1967 was 298% while it was only 31% in engineering. Again, this trend is illustrated by a change in the proportion of students in each field of study (Appendix Table I.8). In 1957-58, 18% of Canadians studying in the States were enrolled in engineering. In 1967-68 this proportion was only 9%. Enrolment in the social sciences increased from 7% to 13% in the same time span.

It is interesting that the increase in Canadians studying the pure sciences in the United States has not been nearly as great as growth in this field in Canadian universities. While enrolments in the pure sciences in Canada in 1967 were some 454% greater than in 1957, enrolments of Canadians in this field in the U.S. were only 109% greater after the same period of time. It could be that in the pure sciences, Canadian universities have developed facilities competitive with those in the U.S. while in newer fields such as the social sciences, the domestic system may not yet be able to meet the requirements of some students who thus find it advantageous to go to the U.S.

The flow of scientists and engineers immigrating to Canada has generally followed the pattern of total professional immigration (Figure 3.2). As a source of new manpower, the importance of this flow has varied over time. This is particularly evident in the case of engineers. Throughout the late 1950's and early 1960's, the number of engineers (1) immigrating to Canada was about one-third to one-half the number of first degree graduates from Canadian universities (Figure 3.6). However, since 1961, immigration has increased rapidly - so much so that in 1965 the number of engineering immigrants was equal to the number of engineering B.A. graduates and has since exceeded the numbers graduating and the gap continues to widen. In 1967, 2,420 students received their first degree in engineering and in that same year 3,704 immigrants stated their intended occupation as engineering.

Though we have no comparable data on the scientific fields, as a result of the rapid growth of Canadian graduates in these fields as compared

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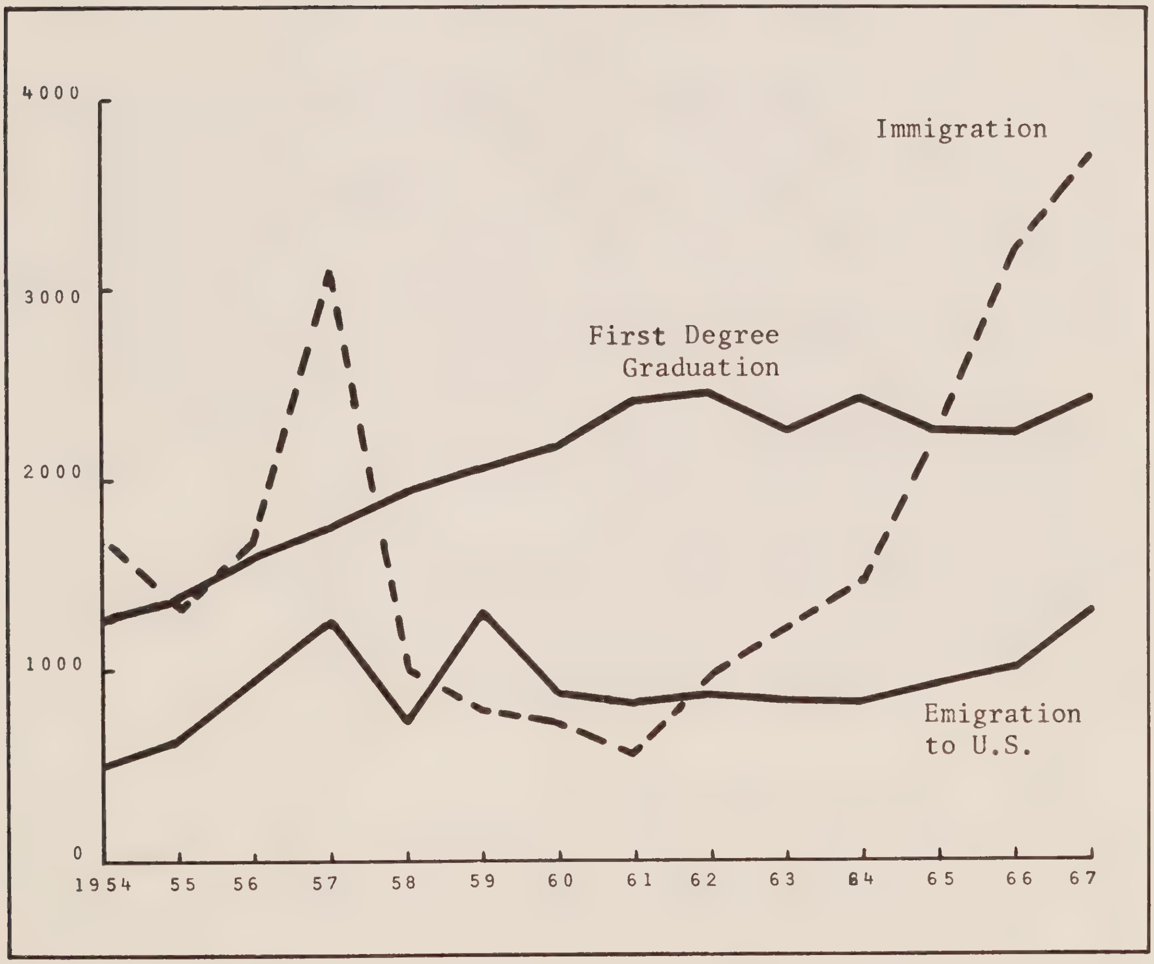
(1) i.e. those who stated their intended occupation as engineering

FIGURE 3.6

ENGINEERS

Immigration, Emigration to the United States and
First Degree Graduations, 1954-67.



Source: Appendix Table I.9.

to engineering graduates, one would expect that immigration would account for a smaller proportion of new entrants into the stock of scientists than is the case for engineers.

Compared to the trend in immigration, the emigration of scientists and engineers from Canada to the United States has been numerically much smaller and relatively constant over time - at least over the period 1962-67 for which we have data on engineers, natural and social scientists[1] (Appendix Table I.9.)

Approximately 50% of the engineers emigrating from Canada to the U.S. were Canadian born. The proportion of Canadian-born was somewhat higher for the natural scientists and greatest in the case of the social scientists, 69%. The relationship between Canadian and non-Canadian-born has also varied over time. From 1962 to 1965, proportionately more Canadian-born engineers and natural scientists appeared to be taking employment in the U.S. Canadian-born engineers, as a percentage of the total, rose from 45% in 1962 to 57% in 1965, while the comparable rise in the natural scientists was from 55% to 68%. Canadian-born social scientists as a percentage of the total increased from 66% in 1962 to 77% in 1966. Between 1966 and 1967, in all fields, the proportion of Canadian to non-Canadian-born fell quite markedly; a 5% decrease in engineers, a 10% decrease in natural scientists and a 17% decrease in Canadian-born social scientists.

Having considered various flows of highly qualified manpower into and out of the Canadian labour force, in the next two chapters we investigate in some detail the characteristics of the employed members of this group by occupation.

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(1) *Data quoted here is published in the National Science Foundation publications, "Scientists and Engineers Abroad, 1962-64" and "Scientists, Engineers and Physicians from Abroad". Surveys of Science Resource series.*

CHAPTER 4

SCIENTISTS AND ENGINEERS

I. Introduction

This chapter is concerned with highly qualified manpower in the fields of architecture, engineering, the physical, life and social sciences(1). The statistical information on which it is based was obtained from a survey of Canada's resources of scientific and engineering manpower conducted by the Department of Manpower and Immigration in 1967. This information was gathered by means of a questionnaire mailed to some 91 thousand individuals. The names and addresses were drawn from a mailing list built up from a variety of sources including the Scientific and Technical Personnel Register previously maintained by the Department of Labour, directories of professional associations, surveys of graduating classes of Canadian universities and government departments.

The Survey was conducted during the first three months of 1967 and a response rate of 74% was obtained. A special follow-up survey of non-respondents was made in order to estimate the actual number of qualified non-respondents. These estimates were added to the initial respondents to provide an estimate of the total survey population. The survey population was estimated to be some 77 thousand. This figure differs from the original mailing list to some extent because of duplication of membership in some of the associations.(2) In addition the estimation procedure made allowance for natural attrition and out migration but not for natural increase or in-migration.

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(1) Throughout the report this group of highly qualified manpower taken as a whole is referred to as "scientists and engineers" and includes architects, engineers, physical, life and social scientists.

(2) A description of the methods used and results of the 1967 Survey is given in Appendix III. The survey questionnaire is included in the appendix.

The purpose of this chapter is to describe the characteristics of the scientists and engineers covered by the 1967 Survey. As the true population of scientific and engineering manpower in Canada is unknown, it is difficult to judge the extent of the coverage of the survey. The survey group however may be regarded as a lower limit to the true population. Thus, while the text of this chapter refers to Canada's resources of scientists and engineers and their characteristics, it is important to note that strictly speaking the group actually being described is the survey population and not the total population of scientists and engineers in Canada.

This chapter is divided into four main sections:

(1) Canada's resources of scientists and engineers and their general characteristics, e.g. age, sex, origin and education.

(2) Aspects of utilization including participation, sector of employment, work function, and education-employment transition.

(3) Geographic distribution and provincial mobility of scientists and engineers.

(4) Earnings and some of the most relevant factors influencing these earnings.

II. Scientists and Engineers

(1) Resources

The 1967 Survey of Scientists and Engineers included just over 77 thousand individuals. As 8% of this group were outside the labour force, (students, housewives, etc.) the employed members of the group totalled some 71 thousand; 64 thousand employees, 7 thousand self-employed.

Of those employed, almost half, some 33,400 were employed in the field of engineering [1]. The second largest group were employed in the physical

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(1) From the survey questionnaire, the architects, scientists and engineers were identified both by the field in which they took their highest degree and by the field in which they were employed. As the two groups, i.e., those who studied in a particular field and those employed in that field are significantly different, it is important to note which group is being examined.

sciences, 9,300, followed by the life sciences, 7,800, and the social sciences, 6,200. The smallest group was employed in architecture, 2,200.

Within the field of engineering, employment is most common in the areas of electrical, civil, industrial or mechanical engineering in that order. 58% of all those employed in engineering are working in one of these fields. In the physical sciences, the largest proportion is employed in chemistry, while agriculture employs the largest group within the life sciences. Economics and statistics predominates as a field of employment within the social sciences, (Table 4.1).

(i) Sex Distribution

The majority of Canada's scientists and engineers are men. Women comprise only a small proportion of the total; 3.7% of the survey population.

There are significant differences between the labour force status of the male and female groups. Only 1% of the women were self-employed compared to 9% of their male counterparts. 70% of the women worked for an employer compared to 84% of the men. Housewives accounted for 12% of the female group. It is interesting to note however, that two-thirds of the housewives were between the ages of 25-39. Once past the child-bearing ages there was a marked trend towards greater female participation in the labour force.

Women are most highly concentrated in the social sciences where, about one social scientist in every six is a woman, (Table 4.1). By contrast, only one engineer in every 700 is a woman.

Two-thirds of the women covered by the survey were employed either in the social sciences, 48%, or the physical sciences, 21%. Only one-fifth of the male group is in these two fields.

Because of the small number of women in the scientific and engineering fields, the analysis will generally be conducted for both sexes combined.

(ii) Age-Structure

The average age of the scientists and engineers employed in Canada is quite low, 41. 65% of this type of highly qualified manpower was less than 45 years old in 1967, just slightly less than the 65.5% of the male labour force below this age. There are nevertheless, marked disparities in the age structure of these two groups. The younger ages are

TABLE 4.1

SCIENTISTS AND ENGINEERS EMPLOYED IN CANADA, 1967
By Field of Principal Employment and Sex

Field of Principal Employment	Male	Female	Final Total(2)
Architecture	2,188	11	2,199
Engineering - Total	33,344	45	33,401
Aeronautical	356	*	357
Ceramic	120	-	120
Chemical	1,540	*	1,546
Civil	5,410	12	5,426
Electrical - Total	6,306	*	6,314
Electronics	3,338	*	3,345
Power	2,968	-	2,969
Geological	398	*	400
Industrial	4,661	*	4,664
Marine	216	-	216
Materials	593	-	593
Mechanical	2,654	*	2,656
Metallurgical	970	*	972
Mining	1,238	-	1,239
Nuclear	162	-	162
Petroleum	1,569	-	1,569
Surveying	339	*	340
Textile	162	-	162
Transportation	503	-	504
Engineering n.e.s.	6,147	10	6,161
Physical Science - Total	8,843	420	9,265
Chemistry	4,132	295	4,428
Atm., Hydro., Litho.	2,383	31	2,415
Mathematics	980	68	1,048
Physics	1,348	26	1,374
Physical Science n.e.s.	-	-	-
Life Science - Total	7,555	218	7,778
Agriculture	2,620	29	2,653
Biology	1,735	165	1,901
Forestry	2,014	*	2,016
Veterinary	1,132	14	1,146
Life Science n.e.s.	54	*	62
Social Science - Total	5,200	954	6,156
Ec. and Stat.	3,880	67	3,949
Psychology	428	13	441
Sociology	190	17	207
Social Work	525	812	1,337
Social Science n.e.s.	177	45	222
Other Fields - Total	5,799	246	6,048
Not Stated	4,228	131	4,367
Final Total(1)	67,157	2,025	69,214

(1) Final total includes numbers less than 10 that were not quoted.
(2) Total includes those who did not state sex.
- Not Reported
* Less than 10

Source: 1967 Survey of Scientists and Engineers.

relatively under-represented among the scientists and engineers. For example, while one-fifth of Canada's male labour force was under 24 in 1966, only 2.9% of the scientists and engineers fell into this age group. This small proportion reflects the longer duration of training for the attainment of professional qualifications as well as a growing trend towards post-graduate training.

There is a smaller proportion of engineers and scientists in the older age groups than for the male labour force in general. Thus while 15.6% of the latter were 55 years and over in 1966, only 11.4% of the engineers and scientists fell into this age group. This differential may reflect factors such as the greater prevalence of compulsory retirement, greater financial security, scientific obsolescence among the scientists and engineers or it may reflect the low rates of enrolment and graduations from universities before the post-war expansion of higher education in Canada.

The age-structure of Canada's engineers and scientists is almost the same between broad fields of employment, (Table 4.2). The architects and physical scientists are the youngest with an average age of 40 years. Life and social scientists are oldest with an average age of 42 years. Engineers have the same average age as all scientists and engineers together, i.e. 41 years. The relatively high proportion of architects 65 years and over reflects the higher incidence of self-employed in this field.

The average age of specific fields ranges from 37 years for mathematicians to 51 years for ceramic engineers, (Appendix Table II.1). The average age of 22 of the 36 specified fields shown is between 40 and 42 years.

(iii) Origin

Twenty-one per cent of Canada's employed scientists and engineers were foreign-born. Of these, 70% of them were born in Europe, with the U.K. accounting for half that percentage, or one-third of the total. The U.S.S.R. was the second largest European source while Poland was the third accounting for 7.4% and 6.6% of the foreign-born group respectively. The U.S.A. was the birthplace of 12%, and 6.5% were born in Asia, (Table 4.3).

The incidence of foreign-born manpower varies between the different fields of employment, (Table 4.3). The largest proportion of non-Canadian born is to be found in the field of architecture, where 31% were born outside of this country. The United Kingdom is by far the

TABLE 4.2

SCIENTISTS AND ENGINEERS EMPLOYED IN CANADA, 1967
By Field of Employment, by Age-Group

Field of Employment	Percentage Distribution by Age-Group							Average Age (Years)
	20-24	25-34	35-44	45-54	55-64	65 & over	Total (a)	
Architecture	2.2	27.2	41.3	17.3	9.9	2.1	100	40
Engineering	2.6	29.2	34.2	23.6	8.7	1.7	100	41
Physical Sciences	3.4	27.8	36.3	23.4	8.5	0.6	100	40
Life Sciences	2.1	22.2	36.3	28.4	9.9	1.1	100	42
Social Sciences	2.3	26.2	33.5	24.2	12.7	1.1	100	42
All Scientists and Engineers	2.9	28.1	33.9	23.4	9.9	1.5	100	41

(a) Figures may not add up to 100 because of rounding.

Source: 1967 Survey of Scientists and Engineers.

most important source of this type of highly qualified manpower supplying 13% of all the architects employed in Canada.

Similarly, a large proportion of the physical scientists were foreign-born; 27%. This is especially true in the case of the physicists as one-third of this group was born abroad. 20% were born in Europe, 12% in the U.K. The U.S.S.R., Australia and Asia were each the birthplace of another 4% of all physicists, (Appendix Table II.2).

Just over one-fifth of the engineers were foreign-born, and of this foreign-born group one-third was born in the U.K., 10% in the U.S., and 9% in the U.S.S.R.

A much larger proportion of foreign-born social scientists came from the United States than was the case for the other fields. Compared with an overall total of 12%, twenty-one per cent of the foreign-born social scientists were born in the U.S. The U.K. was the birthplace of 30%.

The life sciences had a relatively larger proportion of U.S. and U.S.S.R. born scientists, but at the same time they had the smallest proportion of foreign-born in their ranks, only 16%.

Ontario is the place of residence of almost half of these scientists and engineers born outside of the country. Three-quarters of those born in Hong Kong chose Ontario as a place of residence. 64% of the Australians and 59% of the Italians did likewise. On the whole, the choice of province of residence seems to vary considerably, depending on the country of origin, (Table 4.4).

(iv) Education[1]

Only a very small proportion, 4%, of the scientists and engineers employed in Canada do not have a university degree[2]. The pass B.A. or first professional degree is by far the most common among the scientists and engineers. 57% reported this as their highest degree. Honours

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(1) Whenever the term 'degree' is used, whether bachelor's, master's etc., it refers to the highest degree attained by the individual or individuals involved.

(2) An individual without formal university training in a particular field may be certified, usually by the relevant professional association as qualified to practice in a professional capacity in that field.

TABLE

FOREIGN-BORN SCIENTISTS AND ENGINEERS
By Field of Employment,

Field of Employment	Number Foreign Born	% Foreign Born of Total Scientists and Engineers	United States	United Kingdom	Germany
Architecture	692	31.4	4.3	40.4	3.9
Engineering	7,011	21.0	9.7	32.7	3.5
Physical Science	2,543	27.4	10.1	38.7	4.0
Life Science	1,231	15.8	16.1	25.2	4.7
Social Science	1,060	17.2	21.3	29.9	4.9
Other	1,169	19.3	20.0	26.7	2.1
All Fields	14,543 (a)	21.0	12.0	32.7	3.6

(a) Includes those who did not state their field of employment.

Source: Appendix Table II.2.

4.3

EMPLOYED IN CANADA, 1967,
By Place of Birth

Percentages

Place of Birth						
Netherlands	Poland	U.S.S.R.	Europe (Other)	Asia	Other	Total
1.4	12.6	7.1	18.1	2.5	9.7	100.0
3.3	7.4	8.7	14.9	7.0	12.8	100.0
2.4	3.9	5.9	15.0	8.5	11.5	100.0
4.1	3.7	10.9	17.5	6.3	11.5	100.0
7.0	3.6	4.1	13.2	6.1	9.9	100.0
2.2	11.2	3.8	14.8	4.0	15.2	100.0
3.4	6.6	7.4	15.1	6.5	12.7	100.0

TABLE 4.4

SCIENTISTS AND ENGINEERS RESIDING IN CANADA, 1967
By Place of Birth, by Region of Residence

Percentages

Place of Birth[a]	Region of Residence					
	Atlantic	Quebec	Ontario	Prairies	British Columbia	Total (b)
CANADA	6	24	44	16	10	100
UNITED STATES	5	16	43	23	13	100
CARIBBEAN	3	27	43	16	11	100
EUROPE	3	22	51	12	12	100
United Kingdom	4	15	55	11	16	100
France	5	69	17	6	3	100
Germany (Rep. of W.)	4	21	48	16	12	100
Italy	2	34	59	3	3	100
Netherlands	3	18	47	21	11	100
Poland	1	38	48	10	3	100
U.S.S.R.	1	20	57	16	6	100
AUSTRALIA	1	6	64	3	26	100
ASIA	6	17	53	10	14	100
Hong Kong	6	7	75	6	7	100
India	5	17	53	11	14	100
AFRICA	6	31	35	10	19	100
ALL COUNTRIES	6	23	45	16	10	100

(a) The countries listed here are only those from which at least 100 scientists and engineers came to Canada.

(b) Totals may not add up to 100 because of rounding.

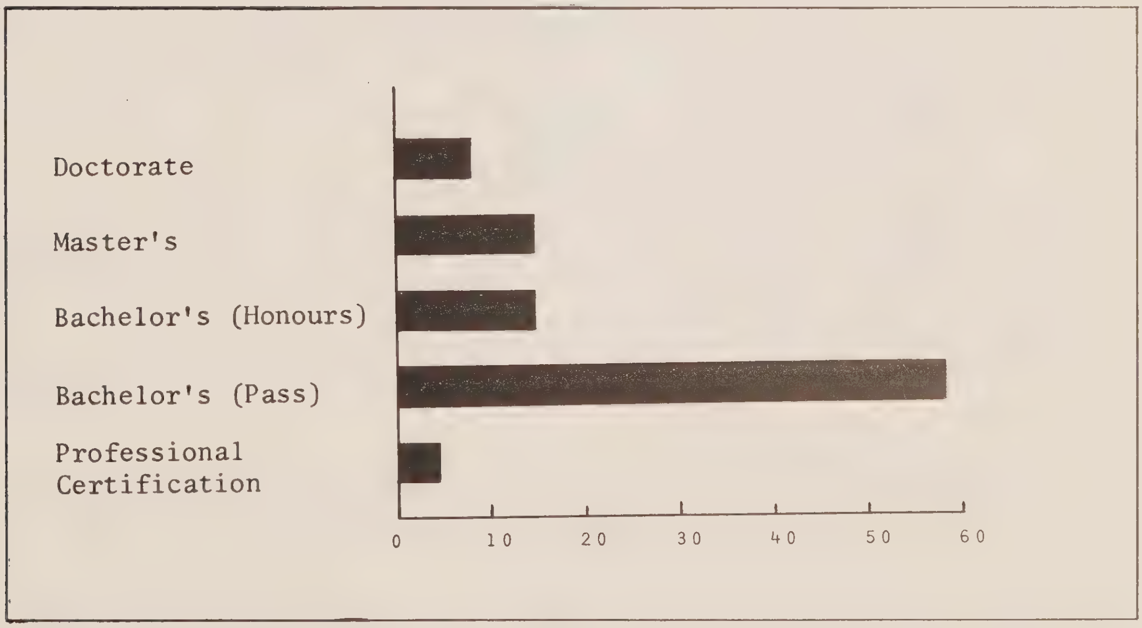
Source: 1967 Survey of Scientists and Engineers.

bachelor's and master's degrees were held by 16% and 15% respectively. Only 8% of the total survey group had doctorate degrees, (Figure 4.1). There is a wide variation in the level of educational achievement among the different occupational classes of scientists and engineers, (Figure 4.2).

Formal education beyond the undergraduate degree level is most predominant in the physical sciences where 45% have a post-graduate degree, 18% with their master's and 27% with a doctorate. A large proportion of those employed in the social sciences also have advanced degrees, however, a master's degree is more common than a doctorate; 35% have master's, 8% doctorates. In the life sciences, the proportion of post-graduate degrees is almost equally split between master's and doctorate's, as 15% possess the former and 16% the latter.

FIGURE 4.1

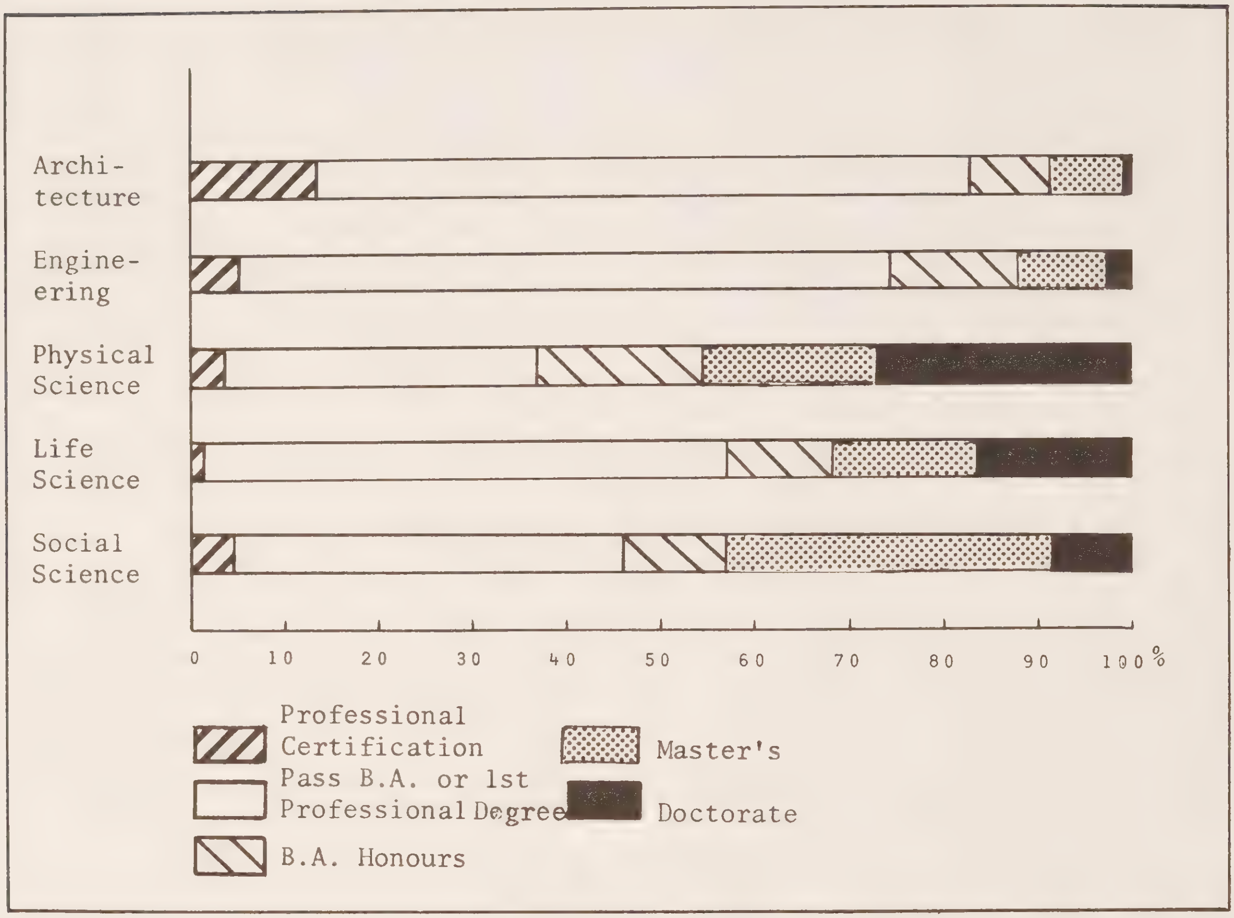
SCIENTISTS AND ENGINEERS RESIDING IN CANADA
By Level of Education



Source: 1967 Survey of Scientists and Engineers.

FIGURE 4.2

SCIENTISTS AND ENGINEERS RESIDING IN CANADA, 1967
By Field of Employment, by Level of Education



Source: Appendix Table II.3

In comparison, only a small proportion of engineers, 2%, have a doctorate degree, and while a master's degree is more common, (almost 10% have this degree) there is a relative dearth of post-graduate degrees in engineering. This is not an unexpected situation as emphasis in the field of engineering has generally been on-the-job training in preference to advanced educational attainment.

Within the major fields of employment there is also a rather wide variation in the level of education of the members of the sub-groups, (Appendix Table II.3). For example, 2% of the chemical engineers have master's degrees as compared to 14% of civil engineers. 46% of the physicists have a doctorate while 21% of the mathematicians have this degree.

Canada has both benefited from and to some extent relied on external educational institutions. Many foreign-born scientists and engineers have had some or all of their educational training before coming to Canada.

In addition, a large number of Canadians obtain one or more degrees outside the country. If they return to Canada for permanent employment, then a positive benefit has been gained in the sense that the individuals return more qualified than when they left. However, some of the Canadians studying abroad do not return and the investment previously made in their education is thus lost. Consequently, a reliance on foreign sources of education may have costs associated with the benefits it provides.

In more concrete terms, how has Canada drawn on foreign educational capacity? Of the 14,530 foreign-born scientists and engineers employed in Canada in 1967, two-thirds received their secondary schooling before coming to Canada. 48%, almost half, took their highest degree elsewhere, (Table 4.5). The United Kingdom and the United States were the main sources of education for this foreign component, providing 25% and 6% respectively of the secondary schooling and 19% and 10% of the education for the highest degree.

Of the 54,686 Canadian-born scientists and engineers only 1.0% received foreign secondary schooling; however 10.4% took their highest degree abroad, (Table 4.5).

For the Canadian group, the United States was by far the most important source of external education. Seven out of ten Canadians studying outside this country went to the U.S. One in ten obtained their highest degree in the United Kingdom.

TABLE 4.5

SCIENTISTS AND ENGINEERS RESIDING IN CANADA, 1967
By Place of Birth, by Foreign Education

	Foreign Education (%)		Number
	Secondary School	Highest Degree	
Foreign-born	66.5	47.5	14,530
Canadian-born	1.0	10.4	54,686
All Scientists and Engineers	14.9	18.3	69,216

Source: 1967 Survey of Scientists and Engineers.

If one considers all the scientists and engineers employed in Canada, 14.9% have received secondary schooling abroad (1.5% in the U.S. and 10.4% in Europe with 5.3% in the U.K.). 18% have their highest degree from a foreign educational institution (7.9% from the U.S. and 7.5% from Europe with 4.8% from the U.K.).

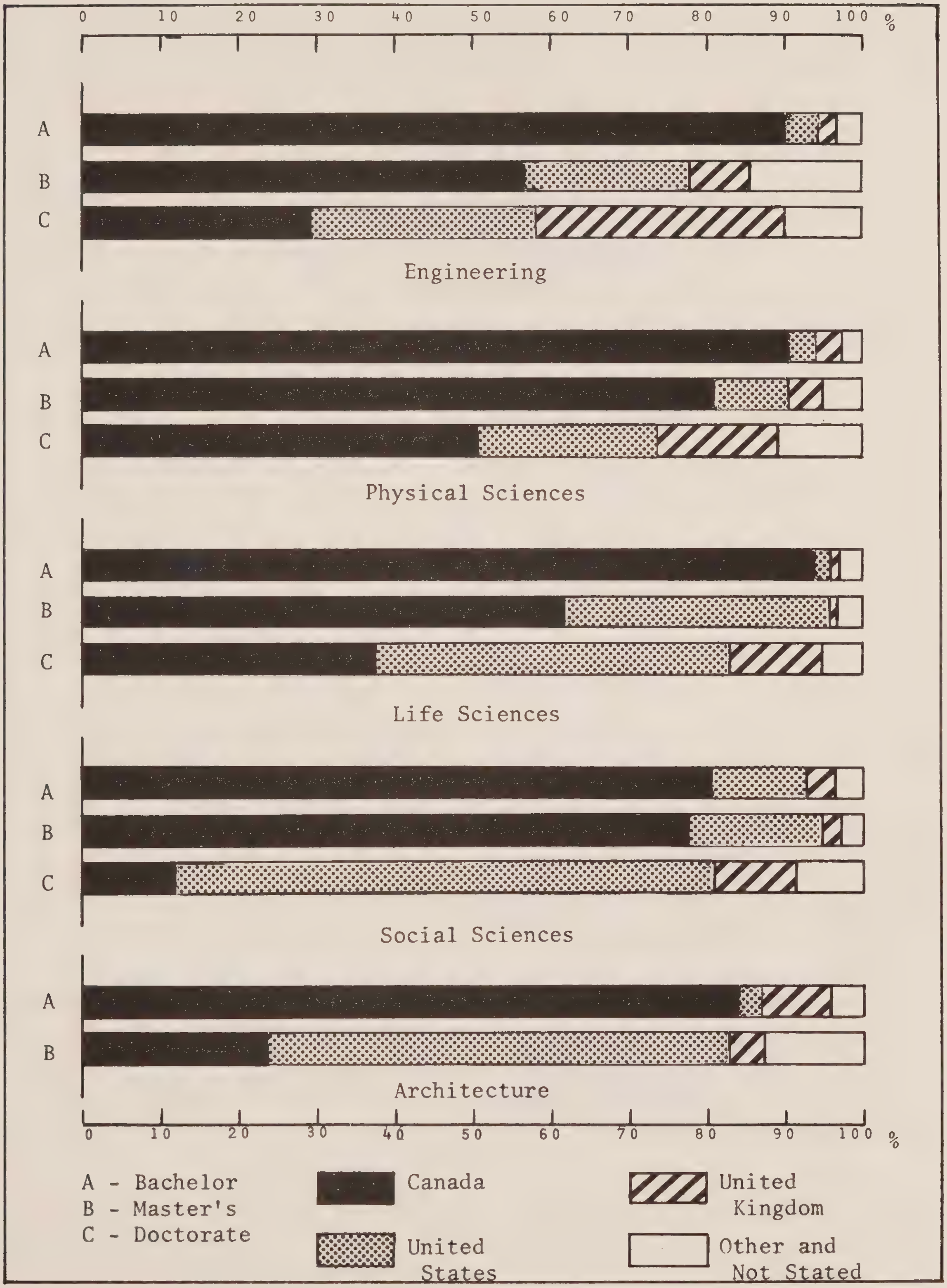
In each field of study, whether architecture, engineering or the sciences, the more advanced the degree, the less likely it is that the degree was obtained in Canada. Of the scientists and engineers, 90% of those with a bachelor's or first professional degree received this degree in Canada. Two-thirds of master's degree holders studied for their degree in Canada while only 40% of the doctorate degrees were Canadian. A similar pattern is evident in each field of study, (Figure 4.3).

In the case where the highest degree was a bachelor's the life sciences had the largest proportion of Canadian granted degrees, 94%. The social sciences had the lowest proportion, 80.5% of Canadian degrees, and the highest proportion, 12% of degrees from the U.S.

At a master's level, the situation is quite different. For example, of all those who received a master's in engineering, 57% of these, (compared to 91% at the bachelor level) were Canadian degrees. In the physical sciences, 81% received a Canadian master's as compared to 78% in the social sciences and 62% in the life sciences.

FIGURE 4.3

SCIENTISTS AND ENGINEERS EMPLOYED IN CANADA, 1967
By Field of Study for Highest Degree, by Country
in which Highest Degree obtained



Source: Appendix Table II.4.

Foreign educational sources predominate at the doctorate level. Over half of the scientists or engineers with a doctorate received this degree outside of Canada. This emphasis on external education is particularly strong in the social sciences where 69% of the Ph.D's were obtained in the United States; only 12% in Canada and 11% in the U.K. While the foreign percentages are not as high in the other fields, they are still considerable, although the distribution is somewhat different. Doctoral studies in engineering were most prevalent in the United Kingdom; 32% studied there. Another 30% received their doctorate in the U.S. and the same per cent in Canada. The highest proportion of Canadian doctorate's occurs in the physical sciences, 50.8%; the U.S. accounted for almost one-quarter of the total and the U.K., 15%.

(v) Scientists and Engineers Abroad(1)

Some 3,160 scientists and engineers, (once resident in Canada) reported their residence in 1967 as outside the country. The United States was the residence of 80% of this group, and another 13% were living in Europe, (7% in the United Kingdom).

Of the 2,533 scientists and engineers responding from the United States, three-quarters were employed, 73% employees, 2% self-employed. 23% were students. A somewhat higher percentage of those responding from Europe were students, 28%. (40% of the U.K. respondents were students.)

The distribution of the respondents from abroad by field of principal employment differed somewhat from the distribution in Canada, (Table 4.6).

The most significant difference is evident in the physical sciences as 28% of those abroad cited this as their field of principal employment compared to 13% of those in Canada.

The scientists and engineers responding from abroad tended to be younger than their counterparts employed in Canada. Forty-three per cent of

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(1) The response rate of the scientists and engineers abroad was too low to allow for estimates of the characteristics of the survey population. Thus data on scientists and engineers abroad refer to the survey respondents only.

the group employed abroad were under the age of 35 compared to 30% of the Canadian employed, (Figure 4.4). The average age of the former was 37, of the latter, 41.

TABLE 4.6

SCIENTISTS AND ENGINEERS EMPLOYED ABROAD AND IN CANADA, 1967
By Field of Principal Employment

Percentages

Field of Employment	Employed Abroad	Employed in Canada
Architecture	1	3
Engineering	45	48
Physical Science	28	13
Life Science	10	11
Social Science	7	9
Other and Not Stated	9	16
Total	100	100

Source: 1967 Survey of Scientists and Engineers.

The level of education of the survey respondents from abroad is significantly higher than that of the Canadian employed scientists and engineers, (Figure 4.5). For example, 28% of the group abroad had doctorate degrees compared to only 8% of the Canadian employed. Similarly at the master's level the comparable percentages are 20% and 15% respectively.

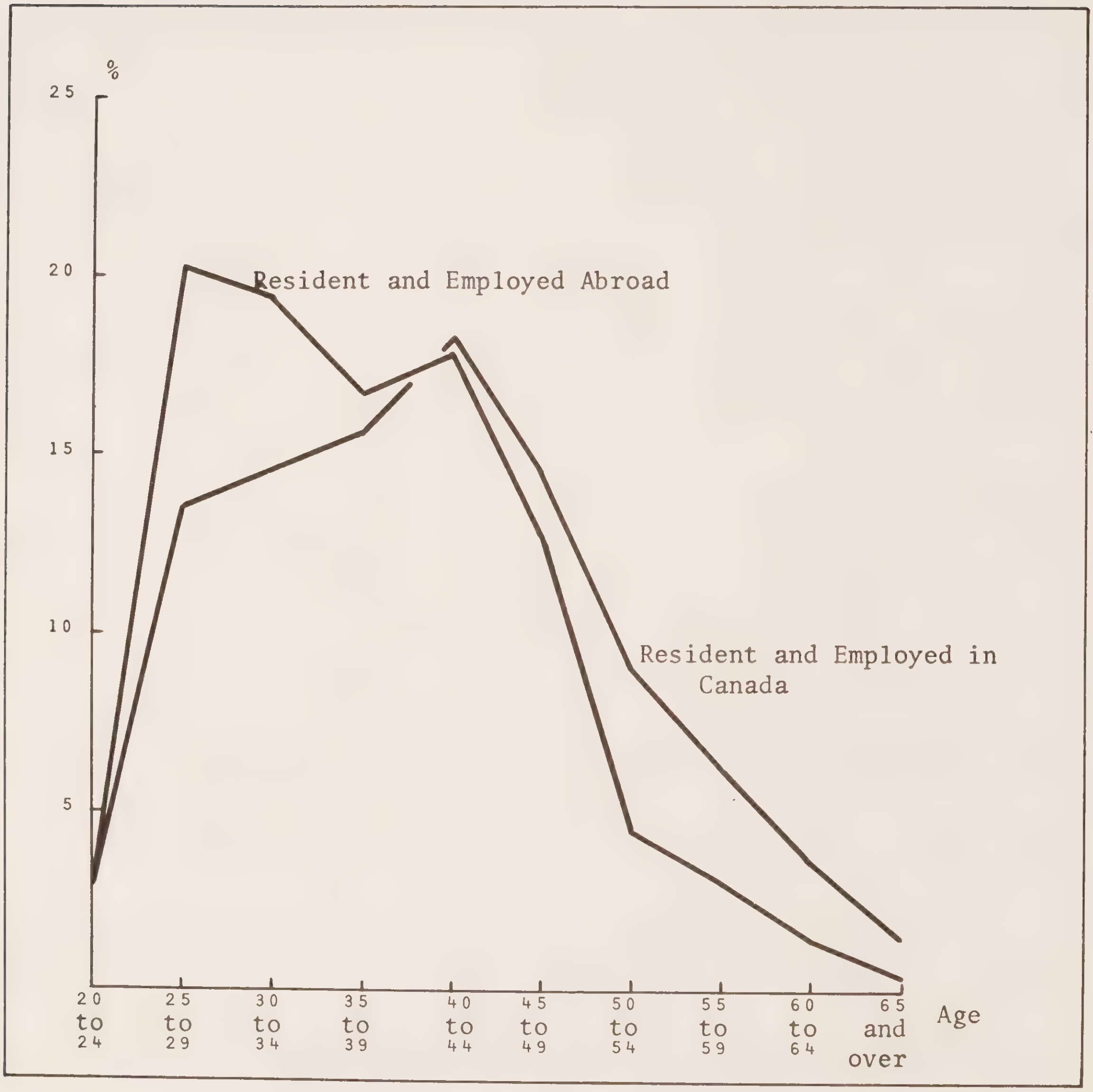
77% of the survey group abroad were Canadian-born. Approximately the same proportion of the scientists and engineers, 79%, employed in Canada were also Canadian born.

Of the Canadian-born abroad, 51% had landed immigrant status in the country of their employment, 25% had temporary status and 8% were U.S. citizens. The rest did not state their citizenship or immigration status.

Of the foreign-born in the group abroad, 30% were Canadian citizens with landed immigrant status in their country of employment; 22% had temporary status; 16% were U.S. citizens and 12% U.K. citizens. The rest were citizens of other countries or did not state their status.

FIGURE 4.4

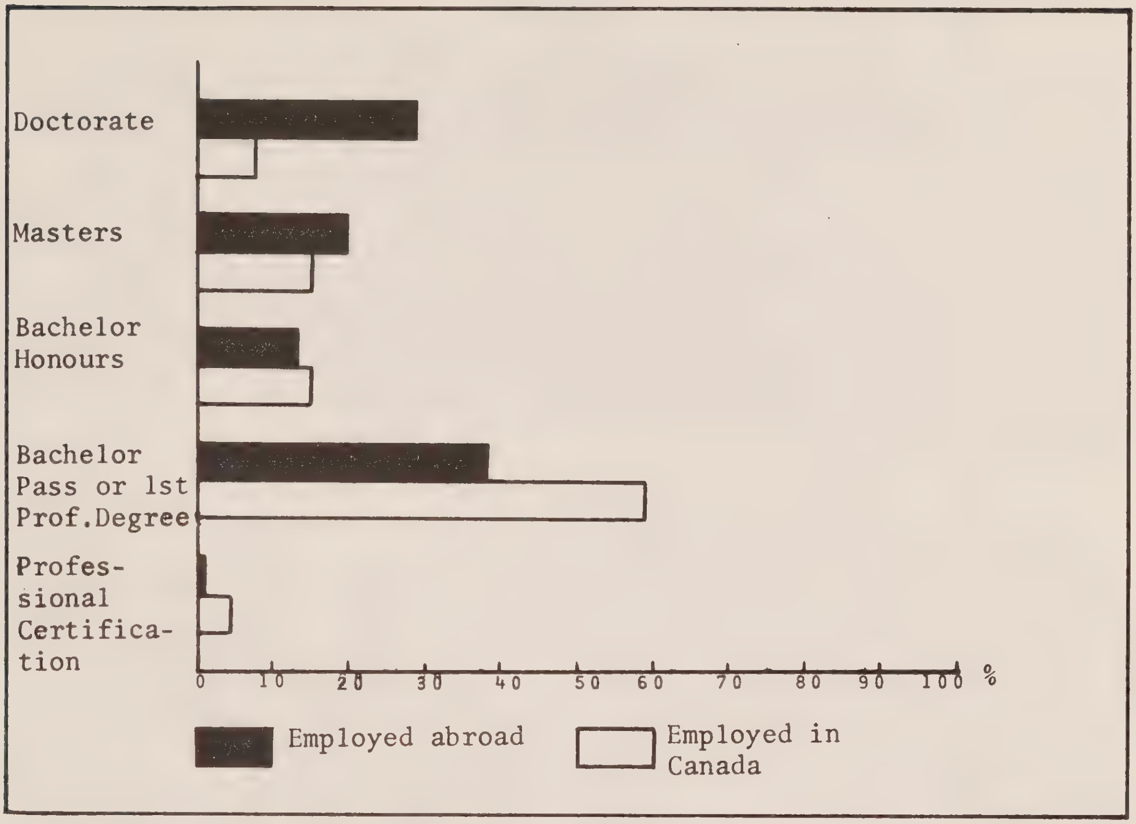
SCIENTISTS AND ENGINEERS RESIDENT AND EMPLOYED IN CANADA,
AND RESIDENT AND EMPLOYED ABROAD, 1967
By Age



Source: 1967 Survey of Scientists and Engineers.

FIGURE 4.5

SCIENTISTS AND ENGINEERS EMPLOYED ABROAD AND IN CANADA
By Level of Education



Source: 1967 Survey of Scientists and Engineers.

(2) Utilization

The concept of manpower utilization is a complex one. In a very general sense, it can be interpreted to refer to the extent to which a certain type of manpower participates in the labour force. More specifically, the term 'utilization' can be used to refer to the nature of this participation; namely, the type of work function performed by the individual. Utilization can also be related to efficiency; that is, one can consider whether the manpower in question is employed in its most productive capacity. While perhaps the most meaningful interpretation this latter concept of 'efficient' utilization is the most difficult to define or measure. With the present data on scientists and engineers it is not possible to consider the efficiency of the manpower utilization. It is possible, however, to investigate in some detail a number of other aspects of utilization.

(i) Participation in the Labour Force

Using labour force participation rates, it appears that the scientists and engineers residing in Canada are quite fully utilized. Only 7.4% of the survey group were not in the labour force. Of the 5,660 scientists and engineers outside the labour force, over two-thirds (3,860) were students who were in effect being prepared to participate in the near future. While 12% of the female scientists and engineers reported their status as housewife, two out of three of these were under the age of 40. After the child-bearing ages, the participation rate of the female group was much higher. In addition, only a small proportion, 6%, of this highly qualified group retires before the age of 55. Of all those retired, 63% reported their age as 65 years or over.

(ii) Sector of Employment

The industrial sector of the economy employs almost two-thirds of all scientists and engineers in Canada. 20% are employed by government agencies while the remaining 14% are employed by educational institutions. The sector of employment, however, varies widely among the principal fields of employment, (Table 4.7).

TABLE 4.7

SCIENTISTS AND ENGINEERS EMPLOYED IN CANADA, 1967
By Field of Employment, by Sector of Employment

Percentages

Field of Employment	Sector of Employment			
	Industry	Education	Government	All Sectors (a)
Architecture	90.1	1.8	7.5	100.0
Engineering	79.7	3.4	15.6	100.0
Physical Science	23.9	22.5	20.6	100.0
Life Science	41.3	13.2	44.5	100.0
Social Science	61.2	14.5	23.4	100.0
All Scientists and Engineers	64.0	14.5	20.0	100.0

(a) Row totals may not equal 100% as some scientists and engineers did not state their sector of employment.

Source: Appendix Table II.5

In the case of architecture, the majority of employed architects reported employment in the industrial sector. Over 50% of architects are, however, self-employed. More specifically, 86% were employed in professional services, (Appendix Table II.5).

A large proportion of the engineers, 38%, were employed in the manufacturing sector of the economy, (Table 4.8). Only 3.4% were employed in education, while 16% were in government services.

TABLE 4.8

SCIENTISTS AND ENGINEERS EMPLOYED IN CANADA, 1967
By Field of Employment, by Selected Sectors of Employment

Horizontal Percentages

Field of Employment	Sector of Employment			
	Primary Industry	Manufacturing	University	Federal Government
Architecture	0.0	0.3	1.0	3.6
Engineering	7.0	38.1	2.4	5.2
Physical Science	9.6	36.0	18.4	14.5
Life Science	23.4	12.5	11.0	22.3
Social Science	3.1	24.8	10.8	13.5
All Scientists and Engineers	8.2	28.9	7.7	9.3

Source: Appendix Table II.5

The physical sciences had the largest proportion of any of the scientists and engineers employed in education, 23%, and the smallest relative proportion in industry, 24%. Government employed about 20% of the physical scientists.

Compared with the other fields of employment, a larger proportion of life scientists were employed by government agencies, 45%, as compared to the total of 20% for all scientists and engineers. Also, there were proportionately more life scientists in primary industry, (23% compared to 8%). This relative emphasis in the primary sector can be accounted for by the large number of life scientists employed specifically in agriculture.

The social scientists were more evenly distributed between the various sectors of employment. 25% were employed in the manufacturing sector, and 33% in other types of industry, such as financial institutions, 7%, and health and welfare organisations, 14%. 23% were employed by the government sector and 15% by educational institutions.

It is possible to pursue the analysis of this aspect of utilisation a little further by considering first, the relationship between sector of employment and level of education and second, between sector of employment and geographical region.

The scientists and engineers with the highest educational qualifications were generally employed in the education or government sector. On the other hand, those with lower levels of education tended to be employed in industry, (Tables 4.9, 4.10).

TABLE 4.9

SCIENTISTS AND ENGINEERS EMPLOYED IN CANADA, 1967
By Level of Education, by Sector of Employment

Percentages

Highest Level of Education	Sector of Employment			
	Industry	Education	Government	All Sectors (a)
Prof. Certification	73.1	3.1	20.9	100.0
Bachelor's	73.5	6.7	18.3	100.0
Bachelor's (Honours)	63.9	18.6	16.3	100.0
Master's	49.8	23.8	25.7	100.0
Doctorate	19.3	51.8	28.0	100.0
All Levels	64.0	14.5	20.0	100.0

(a) Row totals may not equal 100% as some scientists and engineers did not state their sector of employment.

Source: Appendix Table II.6

TABLE 4.10

SCIENTISTS AND ENGINEERS EMPLOYED IN CANADA, 1967
By Level of Education, by Selected Sector of Employment

Horizontal Percentages

Highest Level of Education	Sector of Employment			
	Primary Industry	Manufacturing	University	Federal Government
Prof. Certification	9.9	27.1	0.7	9.8
Bachelors	9.8	33.3	1.5	6.8
Bachelors (Honours)	6.8	33.5	4.8	6.7
Masters	5.2	19.8	13.6	14.0
Doctorate	3.3	9.8	50.0	23.0
All Levels	8.2	28.4	7.7	9.3

Source: Appendix Table II.6

Almost three-quarters of the professionally certified scientists and engineers and the same proportion of those with a B.A. (or professional degree) were employed in the industrial sector of the economy. On the other hand, only a small proportion of these two groups, 3.1% and 6.7% respectively were employed in the education sector. About 20% of each group work for government agencies.

Of those with an Honours Bachelors degree, 10% fewer were employed by industry and a corresponding 10% more were employed in the educational sphere.

A smaller proportion of master's graduates, 50%, were employed by industry. The remaining 50% were almost equally divided between education and government.

Because of their research orientation and their advanced academic qualifications for teaching, it is not surprising that 50% of the doctorate degree scientists and engineers were employed by universities, (Table 4.10). 28% worked for the government while only 19% were employed by industry.

Compared with all other areas of Canada, industry in the Atlantic region employed the smallest proportion of scientists and engineers, 51%, while government hired the largest proportion, 33%, (Table 4.11). In Quebec, the reverse has occurred. Industry relative to the other regions employed the largest proportion of scientific and engineering manpower, 70%, and government the smallest, 15%. In addition, the education sector in Quebec employed a smaller proportion of scientists and engineers, 12.9%, than any other region in the country.

TABLE 4.11

SCIENTISTS AND ENGINEERS EMPLOYED IN CANADA, 1967
By Region of Employment, by Sector of Employment

Percentages

Region of Employment	Sector of Employment			
	Industry	Education	Government	All Sectors (a)
Atlantic	51.5	14.5	32.9	100.0
Quebec	70.3	12.9	15.0	100.0
Ontario	63.3	14.8	20.3	100.0
Prairie	60.6	15.1	23.2	100.0
British Columbia	66.8	15.1	17.2	100.0
All Regions	64.0	14.5	20.0	100.0

(a) Row totals may not equal 100% as some scientists and engineers did not state their sector of employment.

Source: 1967 Survey of Scientists and Engineers.

(iii) Work Function

Almost one-third of the scientists and engineers in Canada are employed

primarily[1] in an administrative or managerial capacity. In addition, supervision is the work function of another ten per cent. This rather large proportion of highly qualified personnel involved in the planning, decision-making and implementation of policies seems to reflect the complexity of modern technology which requires the organizational skills of such a large number of people.

After administration, management and supervision, the largest proportion of scientists and engineers, 15%, reported research and development as their prime work function. Teaching occupied some 10%, design 8%. The remaining 27% were employed in various other functions such as construction, statistical analysis, sales, etc., (Appendix Table II.6).

The importance of the different work functions varies considerably by field of employment, (Table 4.12). For example, teaching, and research and development are the prime work functions of 47% of the physical scientists. Only 12% of the engineers work in these areas. A much larger proportion of the engineers, 44%, are engaged in administration or supervision. Design is a relatively important function of 35% of the architects and 13% of the engineers but it is relatively insignificant in the other fields of employment. The work functions of the scientists and engineers generally correspond to what one would expect, considering the different fields of employment. What is of further interest is the relationship between work function and other characteristics such as education and experience.

The level of education of the scientists and engineers in different work functions varies considerably, (Table 4.13). The very high educational achievement of those in research, teaching and the management and supervision of R & D is striking. 41% of those in research have doctorate degrees and another 26% have a master's degree. 40% of the managers and supervisors of R & D have post-graduate degrees. Scientists and engineers who reported teaching as their prime work function, not surprisingly also have a high level of educational attainment. Almost half have post-graduate degrees; 25% master's and 22% doctorates.

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(1) An individual's prime work function is defined as that which occupies the largest portion of his time during a normal work week.

The proportion of post-graduate degrees drops markedly for the other major work functions, varying between 16% for Development and 5% for both Sales and Production Operation and Maintenance. Where the educational qualifications are relatively low for a particular work function (e.g. Design, Supervision, Sales and Production Operations) the field is seen to be dominated by people employed in engineering who, it may be recalled, generally possessed a lower level of educational attainment than the scientists - 11.5% of the engineers were educated to the masters or doctorate level as compared to 47% for the scientists. On the other hand, where the educational levels are high, physical, life and social scientists dominate.

The relationship between work function and level of experience is somewhat different from that of work function and level of education. As management and supervision are relatively less specialized work functions, they often require a familiarity with a wide range of products, processes and personnel that only years of experience can provide. Consequently, the 'executive' work functions of administration, management and supervision employ a much larger proportion of the scientists and engineers with many more years of experience than are found in other work functions[(1)]. 40% of the managers and supervisors of R & D had more than 20 years experience while 88% had more than 10, (Table 4.14).

Only 17% of the scientists and engineers engaged in design and 18% of those in development had more than 20 years of experience. Low experience levels could be an indication of mobility between work functions. The most obvious movement is from a specific activity such as development into a more general supervisory or administrative capacity.

For those with a post-graduate degree, one can detect a marked pattern of mobility from research and teaching into administration or management, (Table 4.15). Of the doctorate degree holders with less than 10 years experience, a very small percentage are in administrative or management positions, (only 2.5%). However, 40% of this group are involved in research and 46% in teaching. As the experience level increases, the proportion in research and teaching falls and the proportion in management and

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(1) Experience refers to the number of years since Bachelor's graduation.

TABLE

SCIENTISTS AND ENGINEERS
By Field of Employment

Field of Principal Employment	Administration Management	Supervision	Research and Development	Teaching
Architecture	27.5	4.3	9.5	0.8
Engineering	29.6	14.3	10.3	2.1
Physical Sciences	18.4	6.6	32.9	13.6
Life Sciences	22.9	7.1	24.5	8.7
Social Sciences	32.8	6.9	12.3	9.5
All Scientists and Engineers	26.3	10.2	14.5	9.8

(a) Includes all other functions listed in Appendix 2. It also includes those who did not state their work function.

Source: Appendix Table II.7

4.12

EMPLOYED IN CANADA, 1967
and Work Function.

Percentages

Design	Production Operation Maintenance	Counselling Practice, Case Work	Other[a]	Total
35.3	1.1	0.2	21.3	100.0
12.7	5.0	0.8	25.2	100.0
1.0	2.5	0.4	24.6	100.0
0.2	2.2	0.4	34.0	100.0
0.1	0.4	10.5	27.5	100.0
7.7	3.3	1.5	26.7	100.0

TABLE 4.13

SCIENTISTS AND ENGINEERS EMPLOYED IN CANADA, 1967
By Work Function, by Level of Education

Percentages

Work Function	Level of Education	
	Honours Degree and Above	Masters and Doctorates
Research	77.4	66.7
Teaching	67.8	47.1
Management and Supervision of R & D	54.9	41.4
Development - Products and Techniques	33.3	16.2
Administration and Management	31.1	16.2
Design	25.6	13.4
Supervision	24.5	11.2
Sales	21.5	4.5
Production Operation and Maintenance	20.0	4.5
All Work Functions	37.5	22.8

Source: 1967 Survey of Scientists and Engineers.

TABLE 4.14

SCIENTISTS AND ENGINEERS EMPLOYED IN CANADA, 1967
By Work Function, by Years of Experience

Percentages

Work Function	Years of Experience		
	0 - 9	10 or more (a)	20 or more (b)
Management and Supervision of R & D	12.5	87.5	40.0
Administration and Management	13.8	86.2	38.2
Supervision	27.1	72.9	24.5
Sales	28.4	71.6	21.6
Research	32.8	67.2	22.5
Development	40.0	60.0	17.9
Teaching	41.0	59.0	21.5
Production Operation	41.7	58.3	25.9
Design	49.5	50.5	17.1
All Work Functions	30.0	70.0	28.5

(a) This column sums to 100% when added to the preceeding column.

(b) This column, when subtracted from 100%, gives percentages of those with 0 - 19 years of experience.

Source: 1967 Survey of Scientists and Engineers.

administration increases so that for the doctorate scientists and engineers with 30-39 years of experience, 49% are administrators or managers, 20% are researchers and 15% teachers. A similar though modified pattern is also noted in the master's group, (Table 4.15). The proportion of scientists and engineers in the administrative-management category increases from 9% to 40% as experience increases from 10 years to 30-39 years. The proportion in research drops from 22% to 10%.

The prime work function of 20% of the female scientists and engineers is teaching. Counselling and practical case work also feature predominantly as 19.7% of this highly qualified group work in this capacity. Research and development is the work function of another 18%. Administration and supervision, on the other hand, occupy relatively fewer women than men. 37% of the men were employed in these two functions, compared to 19% of the women.

(iv) Research and Development

Research and development are work functions, both basic and essential, not only for the occupations in which they are performed, but also for the economy as a whole. Economic growth and the direction of that growth is often influenced by R & D innovations. Thus, because of the unique role of R & D, a special section on this work function is included in this report.

In 1967, approximately 10 thousand scientists and engineers, about 14% of the scientists and engineers covered by the survey, were engaged in R & D activity, (Table 4.16).

One-third of those employed in the physical sciences were involved primarily in research, development or the management and supervision thereof, and about two-thirds of these concentrated on research activities, (Table 4.17). This high proportion evident in the physical sciences is largely influenced by the physicists, over two-fifths of whom are in R & D, one-third directly involved in research. 38% of the chemists were employed in R & D, 22% in research, (Appendix Table II.7).

A relatively large proportion of the life scientists, 25%, reported some aspect of R & D as their prime work function. Two in ten did research. Biology was the field of employment which had the greatest concentration of research activity among the life scientists and in fact among all scientific and engineering fields of employment - 47.7% were in research and an additional 4% were engaged in either the development or management of R & D.

TABLE 4.15

SCIENTISTS AND ENGINEERS EMPLOYED IN CANADA, 1967
By Work Function, by Years of Experience

1. *Scientists and Engineers Whose Highest Degree is a Doctorate*

Vertical Percentages

Work Function	Years of Experience			
	Less than 10	10 - 19	20 - 29	30 - 39
Management and Administration	2.5	18.5	26.1	49.1
Research	40.0	46.4	31.0	20.7
Teaching	45.8	25.1	27.2	14.5
Other Work Functions	11.7	10.0	15.7	16.2
All Functions	100.0	100.0	100.0	100.0

2. *Scientists and Engineers Whose Highest Degree is a Master's*

Vertical Percentages

Work Function	Years of Experience			
	Less than 10	10 - 19	20 - 29	30 - 39
Management and Administration	8.8	29.2	41.7	40.2
Research	21.8	12.6	9.6	9.8
Teaching	16.5	17.8	15.8	16.2
Other Work Functions	52.9	40.4	32.9	33.8
All Functions	100.0	100.0	100.0	100.0

Source: 1967 Survey of Scientists and Engineers.

Despite the growing concern with research in the social sciences, the proportion of social scientists involved in R & D, (12.3%), was appreciably below that for the physical and life sciences. Between one-sixth and one-seventh of the highly qualified personnel in psychology, sociology and economics and statistics did research and development work.

R & D was considerably less prevalent in the engineering field. Only one in ten engineers was doing research or development work as compared to one in three physical scientists. There was also a marked difference in the balance between development and research activities in engineering as compared to the other scientific fields. For every two engineers doing research there were three active in development whereas the ratio of research to development manpower in the physical sciences was 4:1 and in the life sciences, 15:1. This is not particularly surprising as engineering is most directly concerned with the application of a given body of scientific knowledge. In view of its more practical nature, the development of new products takes precedence over research activities.

There was a marked variation in the importance of R & D between specific engineering fields, (Appendix Table II.7). Over one-half of the textile engineers were engaged in R & D (43% in development). R & D was also very important for ceramic and metallurgical engineers engaging 40% and 30% respectively. These fields however employed only a small proportion of Canada's engineers. On the other hand, in the five fields which jointly comprise 44% of Canada's engineering manpower, namely, civil, power, industrial, mining, and surveying, less than 6% of this manpower was primarily engaged in R & D activity.

One-tenth of the architects were engaged in R & D. Architecture was the only major field where the proportion of personnel in management or supervision of R & D, research, and development was roughly comparable.

It is interesting to compare these results with those published in a study by the Science Council of Canada(1). That study estimated that in 1965, 14% of the Canadian scientists and engineers were employed in R & D. This figure can be compared to the percentages of scientists and engineers employed in R & D in a number of other industrial countries, (Figure 4.6). From this comparison it appears that Canada has a much smaller

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(1) R.W. Jackson, D.W. Henderson, B. Leung; "Background Studies in Science Policy: Projections of R and D Manpower and Expenditure", Study No. 6, Science Council of Canada, Ottawa, Queen's Printer, 1969.

proportion of its scientific manpower engaged in R & D than these other countries. This low percentage can be partially explained by the fact that Canada relies to a large extent on the research and development carried out by the parent companies of the American subsidiaries in Canada and consequently has found less need to develop domestic facilities for this purpose. However, if one includes the number of scientists and engineers who rank research and development as their second work function, it then appears that almost one-quarter of the scientists and engineers employed in Canada are involved in some aspect of R & D.

TABLE 4.16

SCIENTISTS AND ENGINEERS EMPLOYED IN CANADA, 1967
By Field of Employment, by R & D Work Function

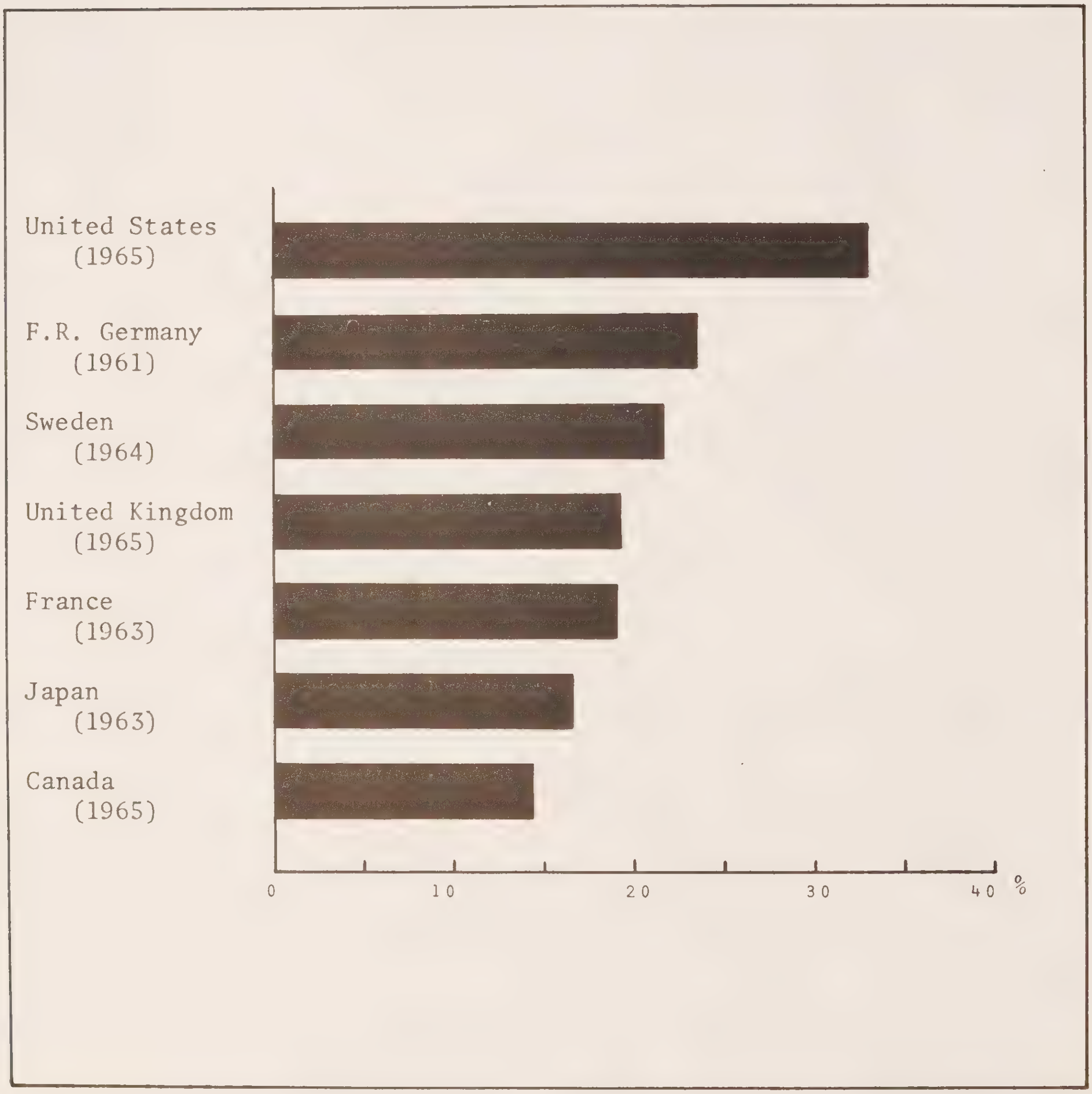
Field of Employment	Work Function			
	Management or Supervision of R & D	Research	Development	Total R & D
Architecture	67	78	66	211
Engineering	878	976	1,559	3,413
Physical Sciences	587	1,952	509	3,048
Life Sciences	345	1,462	101	1,908
Social Science	118	544	100	762
Other	44	176	20	240
All Scientists and Engineers[a]	2,178	5,371	2,480	10,031

(a) Includes field of employment 'not stated'.

Source: Appendix Table II.7

FIGURE 4.6

SCIENTISTS AND ENGINEERS EMPLOYED IN R & D
By selected country as a percentage of total science and engineering
Manpower in the specified country



Source: R.W. Jackson, D.W. Henderson, B. Leung; "Background Studies in Science Policy: Projections of R and D Manpower and Expenditure", Study No. 6, Science Council of Canada, Ottawa, Queen's Printer, 1969.

Because of the importance of R & D it is of interest to examine the characteristics of those engaged in this field. The 1967 Survey provides data on two aspects of scientific and engineering manpower in research and development; namely, their education and the sector in which they were employed.

R & D activity absorbs a large proportion of the most highly educated scientists and engineers. It is the work function of almost one-half of the total national stock of manpower with doctorates in scientific or engineering fields and one-fifth of those with master's degrees. Only one-eleventh and one-sixteenth of those with a general B.A. or professional certification are involved in research and development respectively.

Considering the propensity of the most highly educated scientists and engineers to work in R & D, it is not surprising that they also predominate in this work function. Of the 10,300 scientists and engineers engaged in research and development, 2,744, (26.9%), had doctorate degrees and 2,433, (23.6%), had their master's. A further 1,257, (12.1%), had an Honours bachelor's degree while 3,633, (35.6%) a general degree.

The predominance of highly educated manpower in R & D is particularly evident in the research category where 41% have doctorate degrees, (Figure 4.7). This proportion is especially significant when one notes that only 8% of Canada's scientists and engineers have doctorates. Another 26% doing research have master's degrees. The development of new products and techniques is more dependent on scientists and engineers with bachelor's or first professional degrees. 64% are in this category. This is to be expected since almost two-thirds of the development function is carried out by engineers, the majority of whom have bachelor's or first professional degrees.

43% of the managers and supervisors of R & D have bachelor's or first professional degrees. However, a relatively large proportion as compared to other work functions have doctorates, 23%. It is interesting to note in connection with this work function that the managers and supervisors of R & D appear to have the highest level of experience of any group considered. For example, 88% of these people had more than 10 years experience. 70% of all scientists and engineers had had this much experience. Similarly, 40% had more than twenty years experience as compared to 28.5% of the total group.

TABLE

SCIENTISTS AND ENGINEERS
By Field of Employment,

Field of Employment		
	Management or Supervision of R and D	Research
Architecture	3.0	3.5
Engineering	2.6	2.9
Physical Sciences	6.3	21.1
Life Sciences	4.4	18.8
Social Sciences	1.9	8.8
Other	0.7	2.9
All Scientists and Engineers[a]	3.1	7.8

(a) Includes field of employment 'not stated'

Source: Appendix Table II.7

4.17

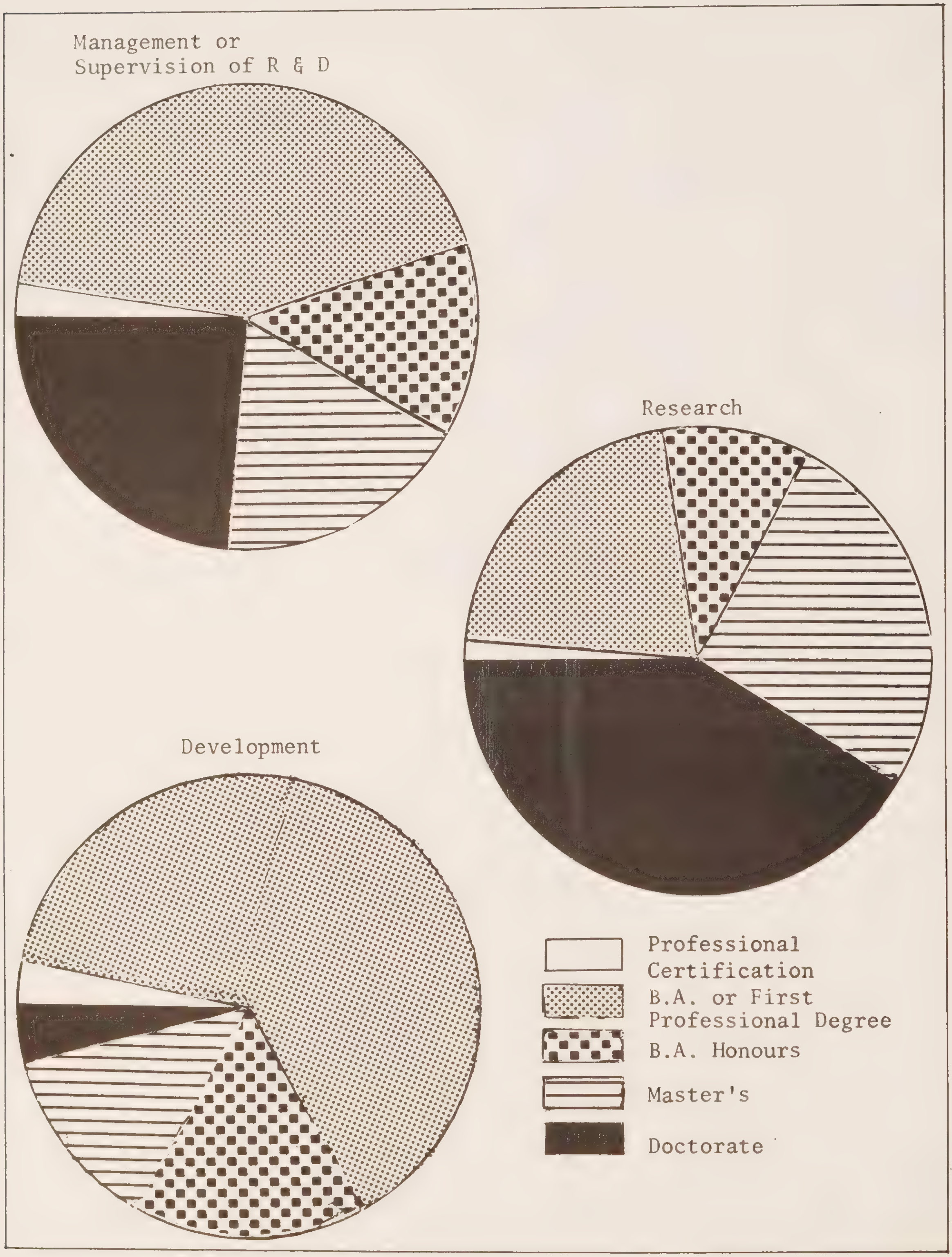
EMPLOYED IN CANADA, 1967
by R & D Work Function

Percentages

Work Function			
Development	Total R & D	Other Work Functions	All Functions
3.0	9.5	81.0	100.0
4.8	10.3	79.4	100.0
5.5	32.9	34.2	100.0
1.3	24.5	51.0	100.0
1.6	12.3	75.4	100.0
0.3	3.9	92.2	100.0
3.6	14.5	71.0	100.0

FIGURE 4.7

SCIENTISTS AND ENGINEERS ENGAGED IN R. & D. IN CANADA, 1967
By Work Function and by Level of Education



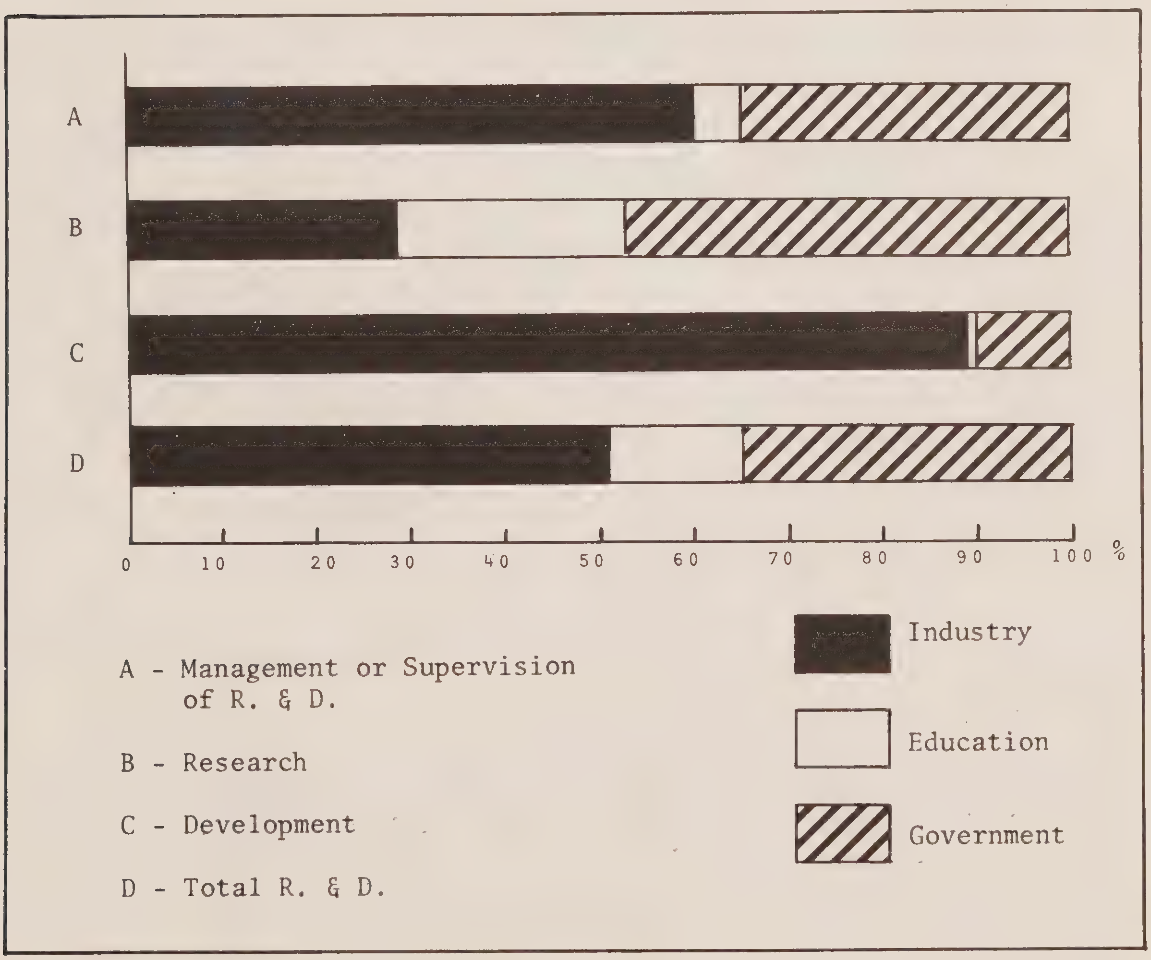
Source: 1967 Survey of Scientists and Engineers.

Primary industry, manufacturing and government agencies together employ almost three-quarters of the scientists and engineers engaged in research and development. The educational sector employs another 14%, ninety per cent of whom are in universities. The remaining 12% work for a variety of organizations such as construction firms, utilities, or professional services.

The government sector employed almost half of the scientists and engineers who worked in a research capacity, (Figure 4.8). 36% were federal government employees. Industry hired some 30% and education, 20%.

FIGURE 4.8

SCIENTISTS AND ENGINEERS EMPLOYED IN R. & D. IN CANADA, 1967
By Sector of Employment



Source: 1967 Survey of Scientists and Engineers.

Industry, under constant pressure to bring new products on to the market, predominated in the employment of scientists and engineers working in the field of development. Almost 90% of development manpower was employed in the industrial sector, two-thirds in manufacturing. Some 9% of the development manpower worked for a government organization while only 1% was employed in the educational sector.

The ratio of managers and supervisors of R & D to actual R & D personnel is significantly different in the educational sector as compared with either industry or government. In the educational sector there is about one manager or supervisor per twenty-two scientists and engineers actively employed in research or development. In both industry and government, the comparable ratio is 1:3. Thus, it would appear that with the less structured and more individualised type of research in universities, overall management is not as essential as it is in industry.

(v) Relationship Between Field of Study and Field of Employment

Most Canadian scientists and engineers move from the educational system into the employed segment of the labour force. However, the correspondence between the field of study of the individual and the actual field in which that person takes employment is not always exact. The shift may be between specialities within a specific discipline, or between specialities in essentially different fields of employment. The education-employment transition is influenced by many factors; for example, the specialized nature of higher education in some fields limits the flexibility of some students. Labour market conditions determine whether the student can in fact find employment in the field in which he has studied. Personal job preference may also result in a field of employment which differs from the field of study. While at present we do not know the relative importance of these factors, it is nevertheless important to at least consider the magnitude of the shift between specialities for a number of reasons. Projections of manpower requirements and a consideration of their implications for education and training policy will need to adjust for these shifts between field of study and field of employment. Knowledge of this transition stage is essential for planning investment in university education and related programmes such as career counselling.

The relationship between field of study and field of employment may be approached in two ways; first, on the supply side; second, by considering requirements. The supply approach considers the occupational distribution of those moving from the educational system into the active labour force. The requirements approach, on the other hand, looks at the mix of different fields of study in each occupation. We will consider the supply approach first.

About four-fifths, (77.8%), of all scientists and engineers held employment in the same field in which they took their highest degree. The proportion however, varied between the major occupational fields, (Table 4.18). For instance, almost nine-tenths of those whose highest field of study was architecture were employed in that same field. Of those who studied engineering, 80% stayed in that field, 4% took employment in the physical sciences and 4% in the social sciences. Those who took their highest degree in the physical sciences appeared to be the most flexible group, as only 58% of this group were employed in the physical science occupations. Thus one could argue that a degree in the physical sciences provides a wider range of employment opportunities than a degree in fields such as engineering or architecture which provide a more specific type of training. The relatively low percentage of employment in the same field in which the education was received might also reflect a lack of employment opportunity in a particular occupation(1).

Within any given scientific field of study, the proportion of those with highest degrees who are employed in that field exhibits some variation between the regions of Canada, (Table 4.19). In general, the proportions are highest in the Prairies and lowest in Quebec and Ontario - the two provinces which together employ about two out of every three scientists and engineers. It may be that because of the numbers of scientists and engineers demanded in Quebec and Ontario, these two provinces have to take a higher proportion of scientists and engineers into positions for which they are not specifically trained. The proportions may also reflect a greater willingness of scientists and engineers to accept employment in occupational fields for which they are not specifically educated because of their desire to reside in the large metropolitan centres of Quebec and Ontario. Also, because of more complex industrial structures and practices in these two provinces, a large proportion of job functions within a given scientific or engineering occupation may be more complex, varied and multi-disciplinary, and provide greater scope for those trained in other scientific fields.

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(1) *It is possible that the shift represents a movement back into a field in which the individual took a first degree. This could be the case if the first degree differed in field of study from the highest degree.*

TABLE

SCIENTISTS AND ENGINEERS
By Field of Study,

Field of Study			
	Architecture	Engineering	Physical Sciences
Architecture	87.2	2.1	0.0
Engineering	0.1	80.4	4.2
Physical Sciences	0.0	14.1	58.0
Life Sciences	0.3	1.6	6.3
Social Sciences	0.1	6.4	1.4
Other	0.8	15.1	10.4

(a) Total includes those who did not state their field of employment.

Source: Appendix Table IV.8

4.18

EMPLOYED IN CANADA, 1967
by Field of Employment

Percentages

Field of Employment			
Life Sciences	Social Sciences	Other	Total[a]
0.1	0.6	4.4	100.0
2.1	4.1	3.8	100.0
2.0	4.7	15.8	100.0
65.7	7.5	11.7	100.0
0.8	76.9	7.9	100.0
5.7	14.1	44.8	100.0

TABLE 4.19

SCIENTISTS AND ENGINEERS EMPLOYED IN FIELD OF STUDY
FOR HIGHEST DEGREE AND RESIDING IN CANADA, 1967
By Field of Study, by Regions

Percentages

Field of Study	Regions				
	Atlantic	Quebec	Ontario	Prairie	British Columbia
Architecture	92.0	96.0	89.5	90.5	96.4
Engineering	86.9	84.3	83.3	88.9	87.1
Physical Sciences	62.2	55.6	61.1	70.8	56.5
Life Sciences	75.1	69.8	64.2	77.4	75.0
Social Sciences	89.7	68.5	82.9	88.9	89.3
Other Sciences	70.5	21.3	46.7	54.9	66.5

Source: 1967 Survey of Scientists and Engineers.

From the point of view of manpower requirements, it is of interest to consider the proportion of those presently employed in a given field who actually took their highest degree in that field, (Table 4.20).

Of those employed in engineering, 91% had taken their highest degree in that field, 5% held a degree in the physical sciences and 1% in the social sciences.

Only 45% of those employed in the social sciences actually took their highest degree in that field; almost one-quarter held engineering degrees and 8% and 12% received their degrees in the physical and life sciences respectively. This low proportion of social science 'specialists' is in part a reflection of the relative newness of the field. It is also perhaps an indication that this field of employment is more diversified than the other fields under consideration and can thus draw on sources of manpower trained in other fields.

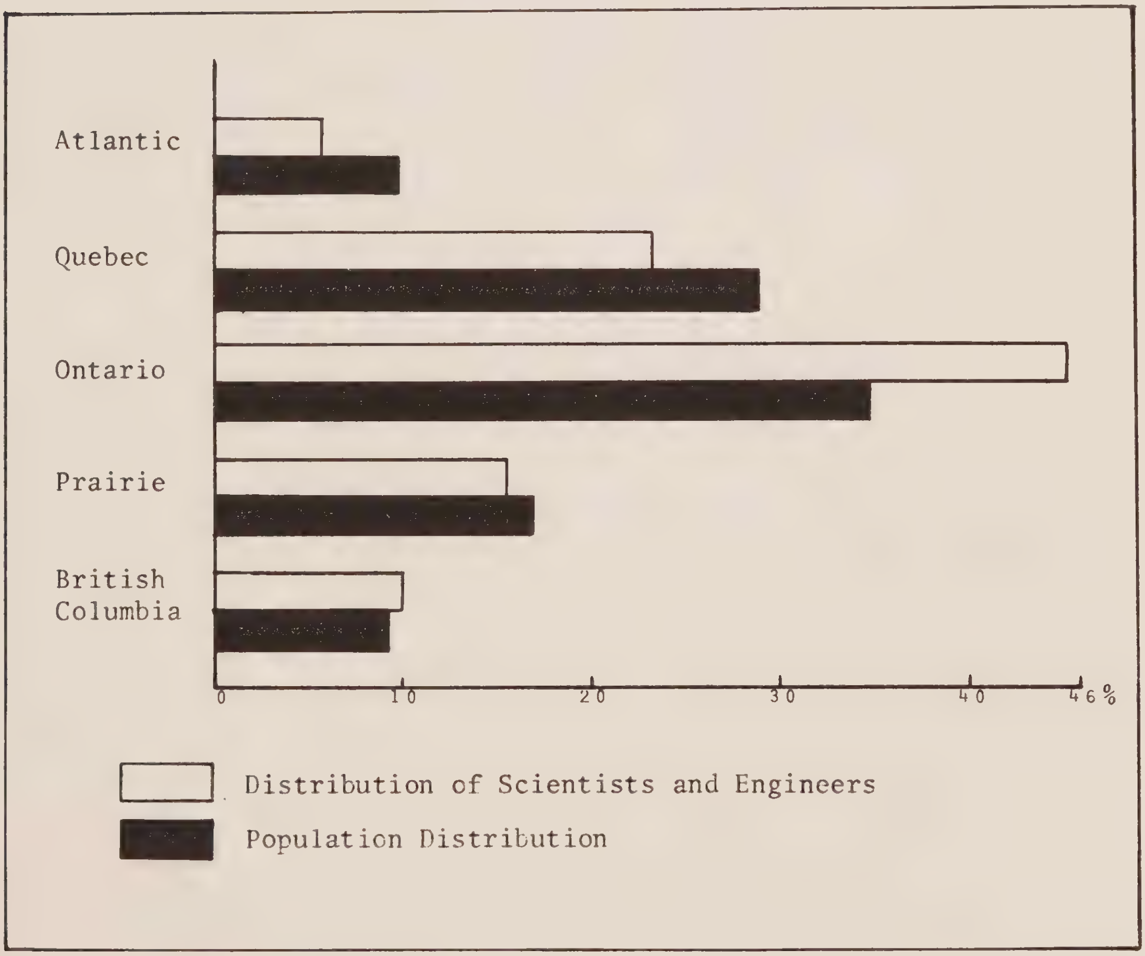
(3) Geographical Distribution and Geographic Mobility

(i) Geographical Distribution

Inter-regional differences in economic structure and development have caused a regional distribution of scientists and engineers quite distinct from that of the general population distribution, (Figure 4.9).

FIGURE 4.9

SCIENTISTS AND ENGINEERS EMPLOYED IN CANADA, 1967
By Region of Employment



Source: 1967 Survey of Scientists and Engineers.

TABLE

SCIENTISTS AND ENGINEERS
By Field of Principal Employment,

Field of Principal Employment			
	Architecture	Engineering	Physical Sciences
Architecture	94.4	1.4	0.1
Engineering	0.2	90.8	4.6
Physical Sciences	0.0	17.3	68.9
Life Sciences	0.1	10.0	2.9
Social Sciences	0.2	24.7	8.5
Other	1.7	23.7	28.7

(a) Total includes those who did not state their field of study.

Source: Appendix Table II.8

4.20

EMPLOYED IN CANADA, 1967
by Field of Study for Highest Degree

Field of Study			
Life Sciences	Social Sciences	Other	Total[a]
1.2	0.1	0.8	100.0
0.6	0.7	1.0	100.0
6.6	0.5	2.6	100.0
82.2	0.4	1.6	100.0
11.7	44.9	5.3	100.0
18.8	4.7	17.0	100.0

Two regions, Ontario and British Columbia, have a larger than proportionate share of the country's scientists and engineers.

Ontario's estimated 31,345 scientists and engineers comprised 45.3% of the national stock, while the province's share of the population was only 35%. In British Columbia, the distributional differences were not as marked. While 9.8% of the scientists and engineers were employed in this province, 9.3% of the population lived there(1).

The prairie region was the residence of almost 17% of the population and the area of employment of some 16% of the survey group.

Quebec and the Atlantic provinces, on the other hand, employed a disproportionately small share of Canada's scientists and engineers - particularly the latter which absorbed 5.7% of scientific and engineering manpower but 9.7% of the population.

As may be expected there are also marked variations in a region's share of the nation's scientific and engineering manpower between different fields of employment, (Table 4.21), due largely to inter-regional differences in economic structure. Thus the Atlantic and Prairie provinces, and British Columbia, account for a larger percentage of life scientists than scientific and engineering manpower in general, indicating the relative importance of primary industry - agriculture, forestry and fisheries in the Atlantic provinces and British Columbia, and agriculture in the Prairies.

Similarly, Ontario's share is largest in the case of social and physical scientists reflecting the concentration of government, education and secondary manufacturing in that province. The relative concentration of engineers and architects in Quebec reflects the considerable expansion of the hydro-electric industry in the sixties and especially in the case of architects, the building boom associated with Expo '67.

Provincial variations in the more specialized occupations of engineering and scientific manpower are relatively marked. They occur largely in occupations attached to industries in which provinces tend to have a comparative advantage. In Prince Edward Island and Saskatchewan, for example, agricultural scientists and biologists comprised a larger proportion of the provinces' scientific work force than was the case in other provinces.

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(1) Percentages for population and Scientists and Engineers in British Columbia include the Yukon and Northwest Territories.

In New Brunswick and British Columbia a relatively larger proportion of the scientists were engaged in forestry; in Quebec and Ontario, in chemistry; and in Alberta, in petroleum engineering and geoscience. Manitoba had a relatively larger proportion of its scientific work force employed in social work than did other provinces.

Some occupations are concentrated in regions in which specialized industries are located. For example, while 45% of all the engineers were employed in Ontario, the province accounted for 78% of ceramic engineers, 71% of all textile engineers and 93% of all nuclear engineers in Canada. Similarly, Quebec employed about 26% of all engineers and close to half of all transportation engineers. As would be expected, marine engineers were more heavily concentrated in the Atlantic provinces and British Columbia; geological engineers and scientists in the Prairies and forestry scientists in the Pacific region.

The distribution of scientists and engineers by place or city of employment clearly indicates the attractiveness of large metropolitan areas for these personnel and the industries employing them, (Table 4.22). The five largest metropolitan areas, representing 32.4% of Canada's population in 1966, employed 47% of all scientists and engineers.

Toronto was the area of employment of the largest number of scientists and engineers in Canada in 1967; 11 thousand, (15.9%).

14% of Scientists and Engineers were employed in Montreal while Ottawa (7.3%), Vancouver (6.3%) and Winnipeg (2.9%) together accounted for another 16.5%.

(ii) Geographical Mobility

In 1967, some 18,700 scientists and engineers were employed outside of their province of secondary school graduation, (Table 4.23). This represented 31.7% of the 58,945 scientists and engineers who completed high school education in Canada[1]. This proportion is consistent with

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(1) This proportion understates the incidence of migration since some of those employed elsewhere prior to the survey may have taken up employment in their province of secondary school graduation at the time of the survey. In addition, the most mobile elements of the scientists and engineers are probably over-represented among the non-respondents to the survey because of the difficulty of obtaining their new addresses.

TABLE

SCIENTISTS AND ENGINEERS
By Field of Employment,

Field of Employment		
	Atlantic	Quebec
Architecture	3.5	25.5
Engineering	5.6	25.8
Physical Sciences	5.1	21.8
Life Sciences	7.0	20.0
Social Sciences	5.0	18.3
Other(b)	6.6	17.6
All Scientists and Engineers	5.7	23.2

(a) Includes Yukon and North West Territories

(b) Includes field of employment 'not stated' category.

(c) Totals may not add to 100.0 because of rounding.

Source: 1967 Survey of Scientists and Engineers.

4.21

EMPLOYED IN CANADA, 1967
by Region

Regions			Total (c)
Ontario	Prairie	British Columbia (a)	
44.7	13.5	12.8	100.0
45.0	13.8	9.9	100.0
48.4	17.1	7.5	100.0
34.6	23.7	14.7	100.0
50.1	16.4	10.3	100.0
53.1	12.2	10.5	100.0
45.3	15.6	10.2	100.0

TABLE

SCIENTISTS AND ENGINEERS
By Field of Principal Employment,

Field of Principal Employment	First	
	Place	% Employed
Architecture	Toronto	26.0
Engineering	Toronto	16.9
Aeronautical	Toronto	26.3
Ceramic	Toronto	48.8
Chemical	Montreal	21.0
Civil	Toronto	17.8
Electronics	Montreal	23.1
Power	Toronto	17.4
Geological	Calgary	26.9
Industrial	Montreal	19.2
Marine	Ottawa	21.3
Materials	Montreal	21.9
Mechanical	Toronto	24.6
Metallurgical	Toronto	14.3
Mining	Toronto	15.1
Nuclear	Ontario-Other*	36.0
Petroleum	Calgary	38.5
Surveying	Montreal	16.8
Textile	Ontario-Other*	37.7
Transportation	Montreal	29.9
Physical Science		
Chemistry	Toronto	18.2
Atm., Hydro., Litho.	Calgary	22.5
Mathematics	Toronto	23.3
Physics	Ottawa	18.9
Life Science		
Agriculture	Ontario-Other*	11.7
Biology	Ottawa	13.8
Forestry	Ontario-Other*	16.4
Veterinary	Ontario-Other*	19.7
Social Science		
Ec. and Stat.	Montreal	17.1
Psychology	Ottawa	19.0
Sociology	Toronto	15.0
Social Work	Toronto	22.8

*Excludes all metropolitan and major urban areas.

Source: 1967 Survey of Scientist[illegible]

RESIDING IN CANADA, 1967
by Place of Employment

Place of Employment			
Second		Third	
Place	% Employed	Place	% Employed
Montreal	20.3	Vancouver	8.1
Montreal	16.3	Vancouver	6.7
Montreal	20.9	Ottawa	18.7
Hamilton	9.9	Montreal	5.0
Toronto	16.0	Vancouver	5.8
Montreal	14.4	Vancouver	9.1
Toronto	17.2	Ottawa	10.9
Montreal	12.4	Vancouver	11.3
Quebec	18.0	Toronto	9.0
Toronto	13.2	Quebec	10.6
Vancouver	14.8	Halifax	13.9
Toronto	19.2	Vancouver	16.0
Montreal	19.4	Vancouver	6.7
Montreal	10.4	Ottawa	5.1
Vancouver	8.1	Montreal	7.5
Peterborough	34.8	Toronto	9.9
Edmonton	10.7	Toronto	10.6
Ottawa	16.2	Quebec	8.8
Montreal	20.4	Kingston	19.8
Quebec	13.1	Toronto	12.3
Montreal	17.0	Ottawa	7.6
Toronto	13.2	Ottawa	11.1
Quebec	12.1	Montreal	10.8
Toronto	13.6	Montreal	11.0
Saskatchewan-Other*	8.9	Alberta-Other*	8.7
Toronto	7.9	Montreal	7.5
British Columbia-Other*	12.2	Montreal	10.5
Quebec-Other*	13.5	Ottawa	6.5
Toronto	15.9	Ottawa	14.8
London	12.0	Toronto	11.8
Ottawa	14.5	Montreal	11.1
Vancouver	15.9	Winnipeg	12.3

TABLE 4.23

SCIENTISTS AND ENGINEERS EMPLOYED IN CANADA, 1967 -
Interprovincial Mobility

Province	Geographic Mobility of Scientists and Engineers		
	Number Graduated (S.S.G.)[a]	Number Employed (New)	Net Movement (2) - (1)
	(1)	(2)	(3)
Newfoundland	188	152	-36
Prince Edward Island	317	79	-238
Nova Scotia	1,437	646	-791
New Brunswick	1,327	518	-809
Quebec	1,777	3,999	+2,222
Ontario	4,073	7,795	+3,722
Manitoba	2,620	945	-1,675
Saskatchewan	3,290	511	-2,779
Alberta	1,912	2,057	+145
British Columbia	1,752	1,887	+135
Total[b]	18,693	18,589	-104

(a) Secondary School Graduation

(b) The slight discrepancy between the graduated and employed totals, which should be identical, is due to differences in the magnitude of their respective 'not stated' groups.

Source: Appendix Table II.9

the findings of Dyck in 1964 that 39% of the 1955 class of science and engineering graduates from Canadian universities were employed outside of their home province (i.e. province of secondary school graduation)(1). Dyck's proportion falls to 32.2% if we exclude those moving abroad. Dyck's study also indicates that engineers are more mobile than scientists, for whereas 40% of the former were employed outside of their home province, only 33% of the scientists were so employed(2).

Ontario is the most popular province of destination of those scientists and engineers who leave their home province to hold employment elsewhere in Canada. This is readily apparent from Figure 4.10 which illustrates the general pattern of mobility between province of secondary school graduation and that of current employment. The numbers in the circles on the map represent the percentage of scientists and engineers who graduated from secondary school in that province who were also employed there. The "solid" and "dashed" lines represent respectively the principal and second most important province of destination of those who left their province of secondary school graduation. For example, in the case of Newfoundland, 58% of those scientists and engineers who graduated from high school in that province were also employed there in 1967. Of those who left the province for employment elsewhere in Canada, the two largest groups, comprising 19% and 9% of all scientists and engineers who graduated in Newfoundland, went respectively to Ontario and Prince Edward Island.

Ontario was the principal destination of scientists and engineers who graduated in each of the other nine provinces and moved to employment elsewhere in Canada. Quebec was the principal destination of those leaving Ontario and the second most important province of destination of those leaving Nova Scotia, New Brunswick and British Columbia. Newfoundland, Manitoba, and Saskatchewan were neither principal nor second most important provinces of destination of movers from any province.

Of the 18,700 movers, 42.5% went to Ontario, 21.5% to Quebec and 11.1% and 10.1% to Alberta and British Columbia respectively. The distribution

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(1) D. Dyck, "The Geographic Mobility of the 1955 Class of Graduates from Canadian Universities in Science and Engineering"; Program Development Service, Department of Manpower and Immigration - Queen's Printer, Ottawa 1967, page 20.

(2) Ibid., pages 19-20.

of movers by province of destination is broadly similar to the provincial distribution of scientists and engineers employed and residing in Canada. A comparison with the distribution of movers by province of secondary school graduation illustrates the extent to which Ontario and Quebec benefit from these interprovincial movements at the expense of the Atlantic provinces and Manitoba and Saskatchewan, (Table 4.23).

It is interesting to note that Quebec retains a higher percentage, 85% of the scientists and engineers graduating from secondary school in that province, than does Ontario (82%) or any of the other provinces. This high retention rate is due partly to the linguistic and cultural differences between Quebec and the other provinces. British Columbia retains two-thirds and Alberta and Newfoundland about three-fifths of the scientists and engineers who matriculated in their respective provinces. New Brunswick, Manitoba and Saskatchewan were only able to retain one-third of the scientists and engineers who received their secondary education in their respective provinces. Prince Edward Island had the lowest retention rate, 23%. Besides cultural and linguistic factors which we alluded to in the case of Quebec, the retention rate will be influenced by the availability of challenging and well-paying job opportunities as well as the adequacy and quality of facilities for the training of scientists and engineers.

The movement between province of secondary school graduation and province of employment is not always direct. Some scientists and engineers leave their province of secondary school to pursue higher education elsewhere in Canada. As a result, many take up first and subsequent employment in their province of university graduation.

In the 1967-68 session, 18,400 students, 7.5% of total enrolment, were attending a university outside their province of residence[1].

While approximately 30% of those who moved went to Ontario; New Brunswick, Quebec and British Columbia each attracted approximately 13% of the total (Table 4.24).

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(1) "Survey of Higher Education 1967-68", D.B.S. Catalogue No. 81-204.

FIGURE 4.10 MOVEMENT OF SCIENTISTS AND ENGINEERS BETWEEN PROVINCE OF SECONDARY SCHOOL GRADUATION AND PROVINCE OF EMPLOYMENT

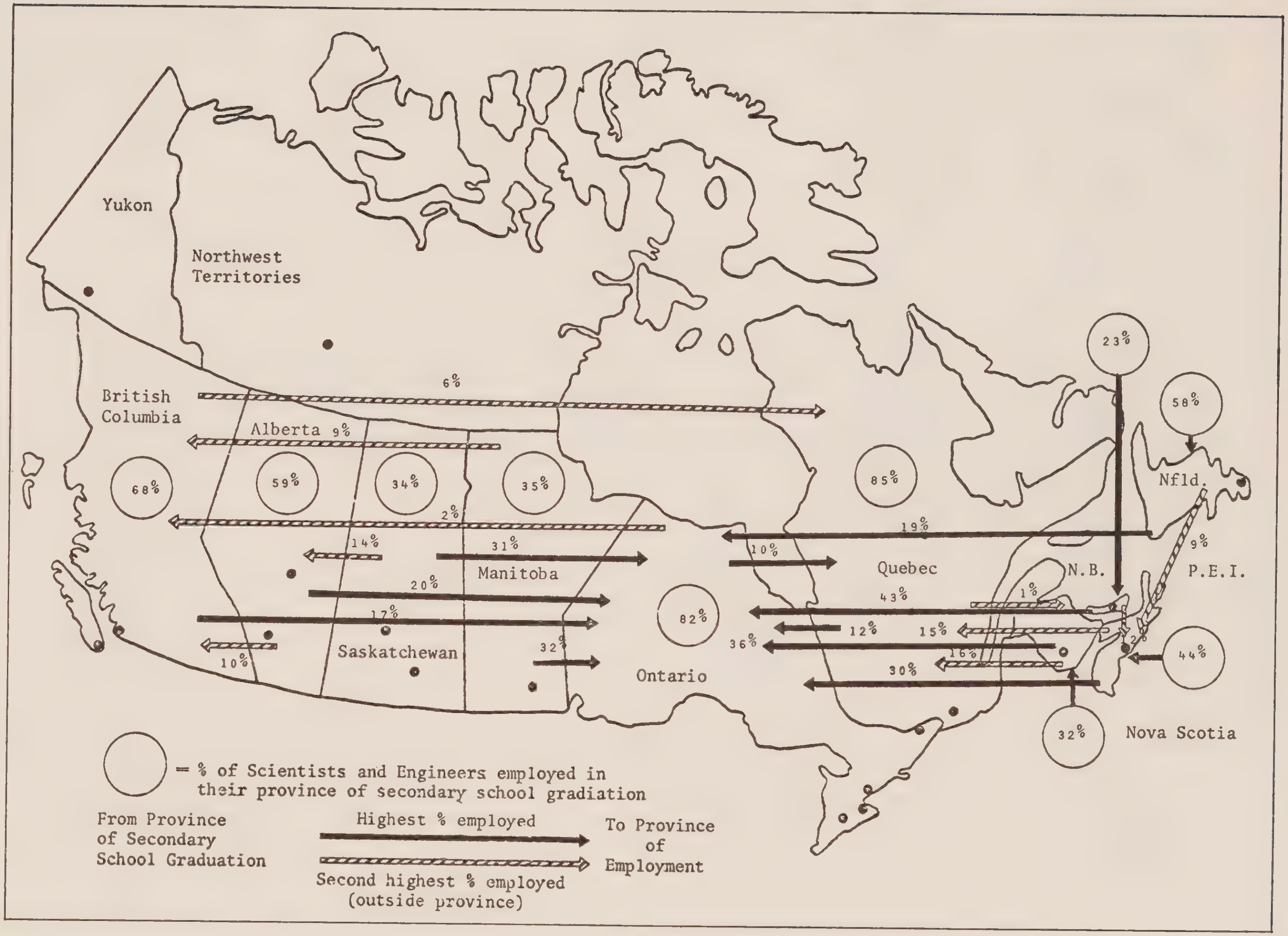


TABLE 4.24

CANADIAN STUDENTS STUDYING IN CANADA
OUTSIDE HOME PROVINCE, 1967-1968

Province	Number of Canadian Students	Number of Canadian Students from Outside Province
Newfoundland	4,410	77
Prince Edward Island	1,291	169
Nova Scotia	9,607	2,599
New Brunswick	7,483	2,301
Quebec	78,064	2,413
Ontario	73,511	5,675
Manitoba	12,455	1,233
Saskatchewan	12,281	502
Alberta	18,873	1,112
British Columbia	27,876	2,404
Canada	245,851	18,485

Source: Survey of Higher Education , D.B.S. Cat. No. 81-204.

Maritime students had by far the greatest tendency towards mobility (Table 4.25). Of all the students who reported their residence as the Maritimes, 18% chose their university outside of the Atlantic region. Students whose home province was British Columbia were least likely to migrate for university.

TABLE 4.25

STUDENTS MOVING FROM HOME PROVINCE
FOR UNIVERSITY EDUCATION - CANADA, 1968

Region	Per Cent
Maritimes	17.8
Quebec	6.5
Ontario	5.3
Prairies	9.7
British Columbia	4.3

Source: Survey of Higher Education ,
D.B.S. Cat. No. 81-204.

It is interesting to note that compared to total enrolments, both New Brunswick and Nova Scotia had very high proportions of non-resident students, 31% and 27% respectively.

(4) Earnings

Education, age, experience and labour force status are all personal characteristics which collectively contribute to the determination of an individual's earning capacity. Exogenous factors such as employment opportunities are no less important. In this section, the relationship between earnings and a number of the most relevant variables are investigated in detail.

(i) Earnings by Employment Status

In each field of employment, the median earnings of the self-employed exceed or at least equal that of those working for an employer, (Figure 4.11). This finding is consistent with the expectation that higher earnings accrue to the self-employed as a partial compensation for some of the risks involved in the entrepreneurial aspects of self-employment.

FIGURE 4.11

SCIENTISTS AND ENGINEERS EMPLOYED IN CANADA, 1967
Median Earnings by Field of Employment, by Labour Force Status

Source: Appendix Table II.10

The largest disparity in median earnings occurs in the field of architecture where the self-employed earn on average $4,200 more than the employees. This fact is particularly significant as almost half of the architects are self-employed.

The self-employed engineers tended to earn as much as the self-employed architects, however, as the employee-engineer earned more than a comparable architect, the difference in earnings between employee and self-employed was less, but still substantial, $3,750.

Monetary advantage to self-employment in the social sciences is on average $2,200, while in the life sciences it is virtually non-existent as both self-employed and employees have median earnings of $10,000.

The dispersion of earnings is greater among the self-employed than among the employees. Median earnings of the scientists and engineers working for an employer vary from $8,400 for the 1,244 social workers to $12,300 for the 847 metallurgical engineers. Median earnings of the self-employed however, range from a low of $10,000 for those employed in agriculture to $20,000 for electronics engineers, (Appendix Table II.10).

(ii) Earnings by Province

Variation in earnings among the provinces reflect such factors as differences in industrial structure, employment opportunities and cost of living. Thus across Canada the median earnings of scientists and engineers vary from a low of $8,800 in Prince Edward Island to a high of $11,000 in Ontario and Quebec. Regionally, median earnings are lowest in the Atlantic provinces, $10,000, somewhat higher in the Prairies, $10,368, and highest in Quebec and Ontario, $11,000. British Columbia ranks in the middle with median earnings of $10,380.

Earnings provincially (or regionally) do not vary consistently among the different fields of employment, (Appendix Table II.11). The greatest variation is evident in the social sciences where the lowest median earnings (those in the Atlantic region) are 75% those of the highest earnings (those reported in Quebec). The least variation occurs in the physical sciences.

Employment in the province of Quebec yields the highest median earnings to engineers, physical and social scientists. The highest median earnings to life scientists occur in the province of Manitoba.

(iii) Age-Earnings Profiles

The age-earnings profile of the managerial and professional occupations is characteristically upward sloping[1] unlike the rather flat age-earnings curve of the unskilled and semi-skilled. This upward trend in earnings with age is particularly evident in the scientific and engineering occupation, (Figure 4.12). Earnings rise most rapidly in the younger age groups reflecting the benefit of experience on-the-job.

Median earnings of architects peak at a relatively young age, between 40-44. Engineers, on the other hand, appear to earn the most in the age group 50-55. The earnings in the scientific fields peak at a later age. For the physical and social scientists, earnings reached their maximum between the ages of 55-59. Greatest median earnings of the life scientists accrued to those between the ages of 60-64.

In each field of employment, except architecture, there appears to be a leveling off or actual drop in earnings in the late 40's or early 50's. However, in the age group 45-49 for engineers and 50-54 for the scientific fields, there is a substantial increase in the median earnings reported. This most likely reflects a shift into the higher paying administrative positions in these age groups.

(iv) Earnings, Age and Level of Education[2]

The marginal benefit accruing to scientists and engineers with doctorate degrees over those with bachelor's is considerable and increases significantly with age and experience, (Figure 4.13). The average difference in earnings between these two levels of education is greatest in the life sciences, \$3,080, and in the physical sciences, \$2,700. The differences for engineers and social scientists are smaller but still substantial, \$2,100 and \$2,060 respectively.

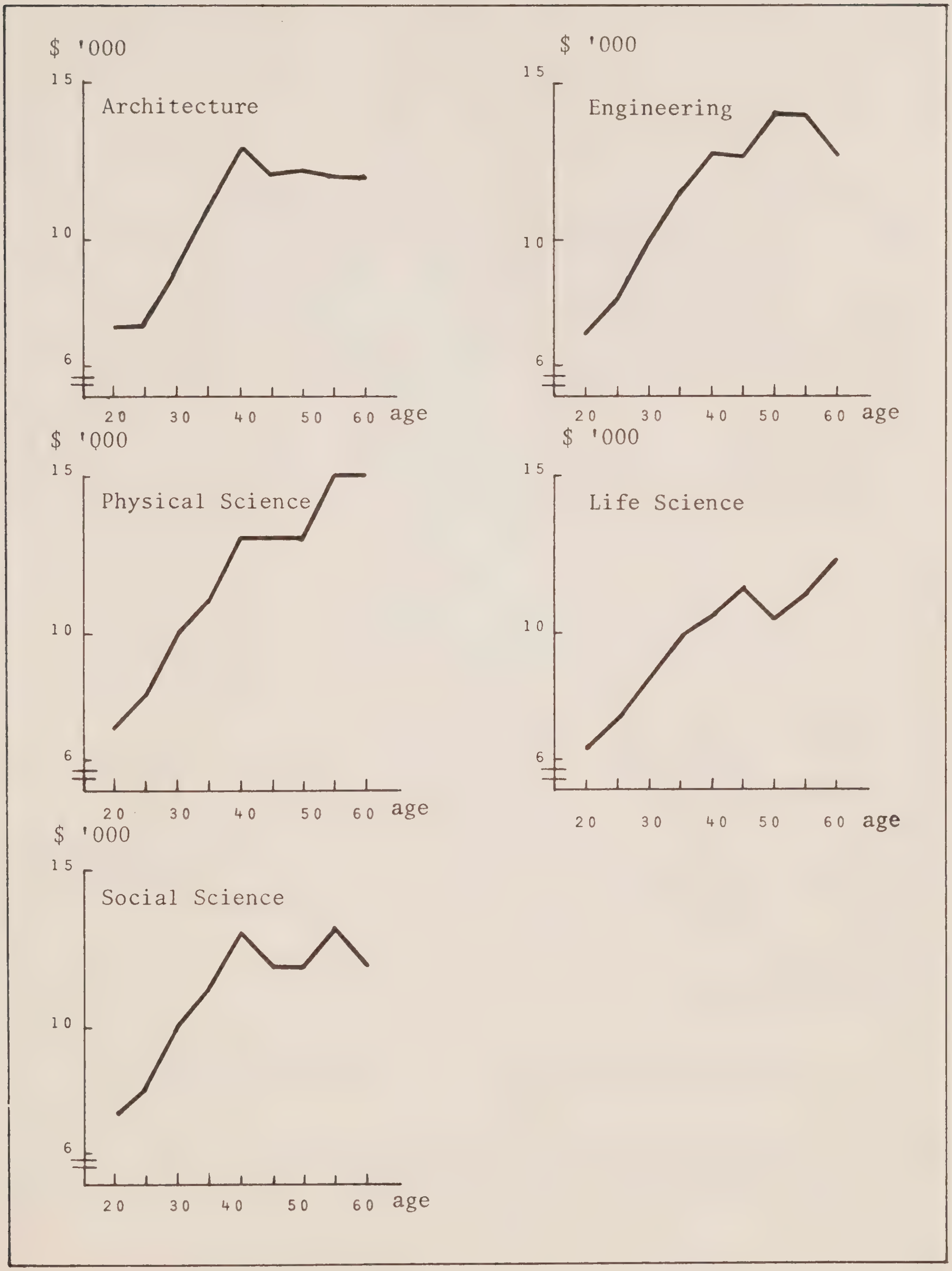
---

(1) J.R. Podoluk, Incomes of Canadians, Dominion Bureau of Statistics; Ottawa, 1968, page 83.

(2) The relationship between earnings, years since B.A. graduation and level of education is similar to the age-earnings-education pattern and consequently has not been considered separately.

FIGURE 4.12

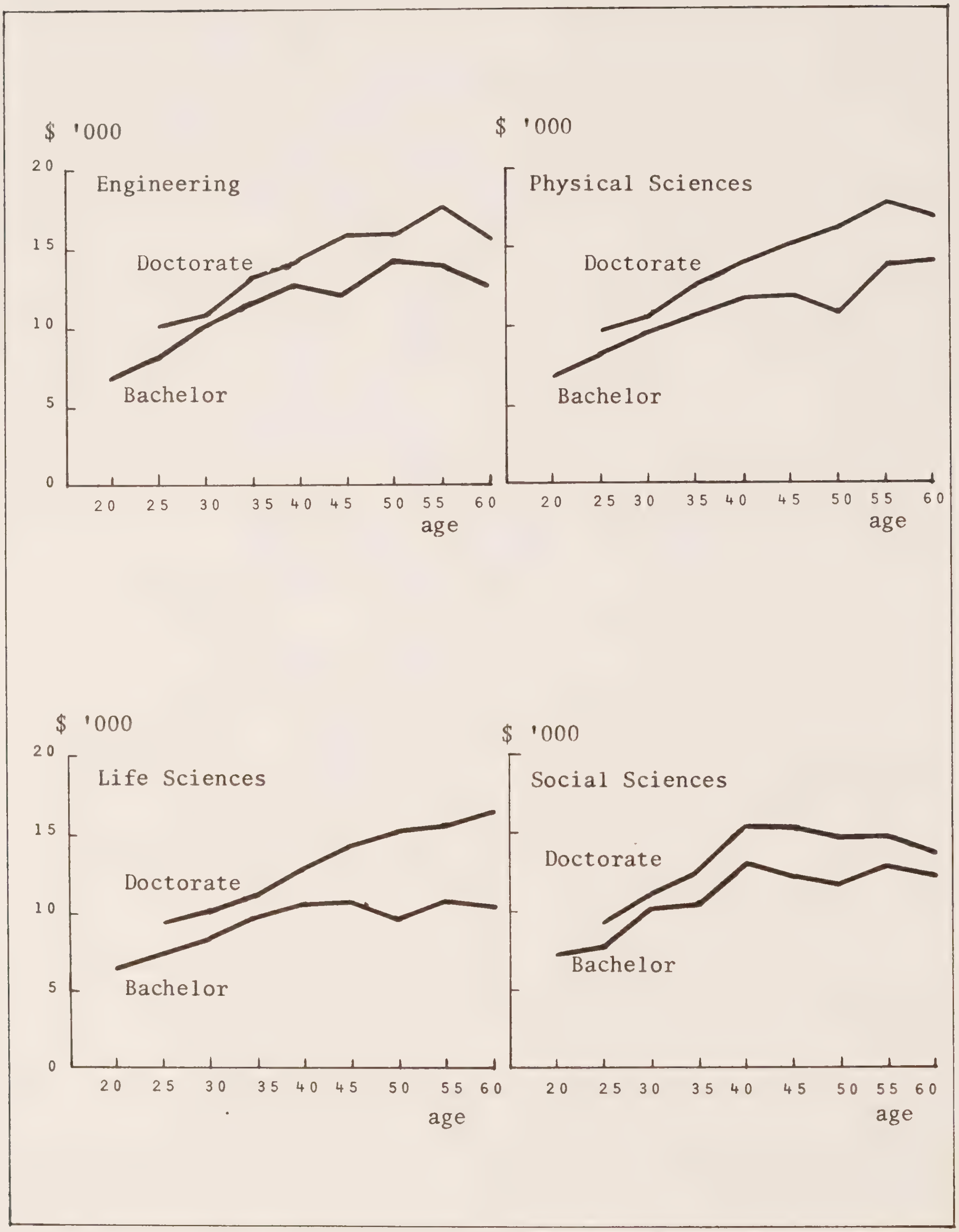
SCIENTISTS AND ENGINEERS WORKING FOR AN EMPLOYER
Median Earnings by Field of Employment, by age



Source: Appendix Table II.12

FIGURE 4.13

SCIENTISTS AND ENGINEERS WORKING FOR EMPLOYERS, 1967
Median Annual Rate of Earnings by Field of
Employment, Age and Level of Education



Source: Appendix Table II.12

In both the physical and life sciences, the greatest difference in earnings occurs between the ages of 50 and 54 where those with a doctorate earn approximately $5,400 more per annum than those with a bachelor's degree. The advantage of a doctorate in engineering or the social sciences is most evident in the age-group 45-49 where engineers receive about $3,800 more with a Ph.D., and the social scientists, $3,140.

The monetary advantage of a master's degree (as compared to a bachelor's) is not as consistently obvious as it is in the case of a doctorate degree. The median earnings of master's-life scientists are greater than those with bachelor's in seven of the eight age-groups between 25-65. For master's-engineers, the earnings are greater in six of the eight groups. However, both in the social sciences and the physical sciences in five of the eight groups, the median earnings of master's degree holders are less than those with a general bachelor's degree.

This finding can be partially explained by differences in work function between those with a bachelor's and those with a master's degree, (Table 4.26).

TABLE 4.26

SCIENTISTS AND ENGINEERS WORKING FOR EMPLOYERS
Median Earnings by Work Function, by Level of Education

Work Function	Bachelor's Degree		Master's Degree	
	Per Cent	Median	Per Cent	Median
Admin. Management	28	$13,000	23	$13,800
Supervision	13	11,000	7	11,000
Research	3	9,870	14	9,750
Teaching	6	8,400	18	10,500

Source: Appendix Table II.13

There is a higher proportion of bachelor's degree scientists and engineers (41% as compared to 30% of the master's holders) in the high-paying functions of administration and supervision. Also, in research, where 14%

of the master's-scientists and engineers are employed, this group reported lower median earnings than 3% of the bachelor's group also working in this capacity.

(v) Female Earnings

The female earnings reported were consistently lower than those of their male counterparts (Table 4.28). Part of this variation reflects the fact that more women work part-time and this tends to lower their median earnings. However, even taking this factor into account, the earnings gap is still considerable. For example, there is a $4,000 difference in the median earnings of men and women in the social sciences. In a field such as social work, where two-thirds of the employees are women, the one-third male group has median earnings of $1,800 above those of the female group. Other fields produce similar though less divergent results. Women in the life sciences earn approximately $2,600 less than the men and in the physical sciences, $2,800 less.

On average, median earnings of women in the sciences and engineering are 71% that of the men. This can be compared to the situation in 1961, when average earned income per female in the labour force was only 49% of the equivalent average for the male labour force[1].

One would expect this male-female earnings differential to be determined by differences in such factors as level of education, experience, sector of employment and work function. From the 1967 survey data we can comment on two of these variables; namely, education and work function.

For each level of education, the median earnings of the female group were less than those of the male group (Table 4.27, Figure 4.14), however, the difference is less the higher the level of education. At the doctorate level the difference in median earnings is $2,552, while at a bachelor's level it is $3,460.

Also, if one compares the percentage distribution of the female scientists and engineers by level of education with the male group, it can be seen that the female group has a greater proportion of post-graduate degrees than does the male group (Table 4.28). Thus it appears that women do not earn less than men in the scientific and engineering fields for reasons of lower educational qualifications.

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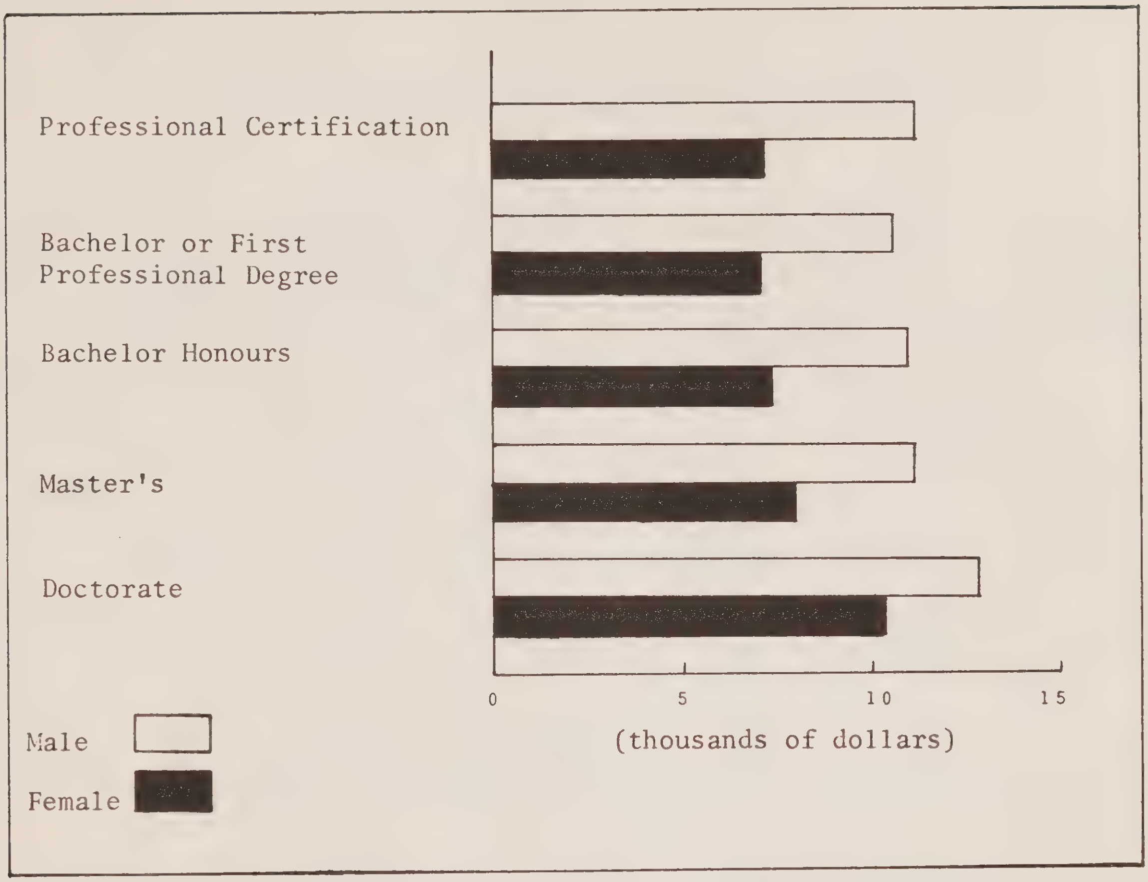
(1) J. R. Poduluk, Earnings and Education, D.B.S., 91510.

FIGURE 4.14

SCIENTISTS AND ENGINEERS IN CANADA, 1967
Median Earnings by Sex and Level of Education



Source: 1967 Survey of Scientists and Engineers.

TABLE 4.27

SCIENTISTS AND ENGINEERS EMPLOYED IN CANADA, 1967
Median Earnings by Field of Employment, by Sex

Field of Employment	Number		Median Earnings		Difference in Median Earnings	Female Earnings as % of Male Earnings
	Male	Female	Male	Female		
Engineering	28,855	43	$11,248	$8,100	$3,148	72
Physical Sciences	7,857	389	11,100	8,240	2,860	74
Life Sciences	6,106	194	10,000	7,320	2,680	73
Social Sciences	4,432	880	11,800	7,800	4,000	66
All Scientists and Engineers (a)	56,091	1,837	11,000	7,800	3,200	71

(a) Includes 'Other Fields' and 'Not Stated' categories.

Source: 1967 Survey of Scientists and Engineers.

TABLE 4.28

SCIENTISTS AND ENGINEERS WORKING FOR EMPLOYERS IN CANADA, 1967
Median Earnings by Level of Education

Level of Education	Male Scientists and Engineers - %	Female Scientists and Engineers - %	Median Earnings		Difference in Median Earnings
			Men	Women	
Professional Certification	3	6	$11,248	$ 7,250	$3,998
Bachelor	59	25	10,600	7,140	3,460
Bachelor (Honours)	15	17	11,000	7,400	3,600
Masters	14	45	11,200	8,000	3,200
Doctorate	9	7	12,872	10,320	2,552

Source: 1967 Survey of Scientists and Engineers.

A prime determining factor in the male-female earnings differential appears to be related to differences in work function. 40% of the male scientists and engineers work in an administrative, managerial, or supervisory capacity. Only 20% of the female group participate in these high-paying 'executive' functions. Discontinuous work experience may prevent women from moving into these higher paying positions of more senior responsibility[1]. Women concentrate more in teaching, counselling and case work, and the median earnings of these work functions are all below the average of $10,900 for all functions, (Table 4.29).

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(1) *Jenny R. Podoluk, Incomes of Canadians, 1961 Census Monograph, Dominion Bureau of Statistics, Ottawa, 1968, page 69.*

TABLE 4.29

SCIENTISTS AND ENGINEERS WORKING FOR EMPLOYERS IN CANADA, 1967
Median Earnings by Work Function, by Sex

Work Function	% of all Male Scientists and Engineers	% of all Female Scientists and Engineers	Median Earnings
Administration, Management	26.8	8.3	$13,700
Supervision	10.2	9.5	11,000
Research	7.5	16.7	10,500
Teaching	9.5	20.0	9,600
Counselling, Case Work	1.0	19.8	7,800

Source: 1967 Survey of Scientists and Engineers.

(vi) Earnings by Immigration Status

The median earnings of landed immigrants from the United States are greater than the median earnings of either Canadian citizens or landed immigrants from other countries in three of the four fields of employment, (Table 4.30).

While we have no data to help explain this finding, it is most likely that the difference is caused by differences in education, experience, work function and sector of employment. It is possible that a number of the U.S. landed immigrants hold high-paying administrative and supervisory positions with American subsidiaries in Canada.

(vii) Earnings by Sector of Employment

The median earnings of the scientists and engineers do not vary substantially among the different sectors of employment, except in the case of those employed in health and welfare organizations, (Table 4.31).

TABLE 4.31

SCIENTISTS AND ENGINEERS WORKING FOR EMPLOYERS IN CANADA, 1967
By Sector of Employment, by Median Earnings

Sector of Employment	Number Reporting	Median Earnings
Industry	4,116	$11,500
Manufacturing	17,946	11,160
Construction Firm	1,726	12,000
Trans. Org. or Serv.	1,153	11,800
Communications Org.	1,140	10,900
Utility	2,362	11,600
Trade Outlet	595	11,820
Financial Institution	712	12,000
Health or Welfare Org.	1,079	8,472
Professional Serv.	4,012	10,800
Other Org. or Services	337	11,028
Education	9,120	10,270
Government	13,026	10,500
Not Stated	649	10,000
All Sectors	57,973	10,950

Source: 1967 Survey of Scientists and Engineers.

TABLE

SCIENTISTS AND ENGINEERS WORKING
Median Earnings by Field of Employment,

Field of Employment	Canadian Citizens	Number	
		Landed Immigrants	
		United States	United Kingdom
Engineering	27,475	145	665
Physical Sciences	7,317	107	446
Life Sciences	5,916	108	97
Social Sciences	4,991	75	80

Source: 1967 Survey of Scientists and Engineers.

4.30

FOR EMPLOYERS IN CANADA, 1967
Citizenship and Immigration Status

	Median Earnings			
From	Canadian Citizens	Landed Immigrants From		
Other Countries		United States	United Kingdom	Other Countries
241	$11,300	$17,000	$11,000	$ 9,600
235	11,000	11,800	10,300	11,000
66	10,000	9,977	10,000	10,200
90	10,950	13,200	10,000	7,600

Employees in the latter sector reported median earnings of about $2,500 less than the median of $10,950 for all the scientists and engineers. The difference in earnings is most likely related to the fact that a large proportion, one-third, of those employed in health and welfare organizations do counselling and practical case work, and this type of work function received the lowest median earnings of all work functions. While the earnings of those in the educational sector are somewhat lower than the average, the earnings of those employed specifically in universities is above the average. Similarly, the median earnings of all those employed in government agencies is $10,500 as compared to an overall median of $10,950. Federal government employees, however, reported median earnings of $11,000.

Earnings by sector of employment vary somewhat more within the different fields of employment, (Table 4.32).

TABLE 4.32

SCIENTISTS AND ENGINEERS WORKING IN CANADA, 1967
Median Earnings by Sector of Employment, by Field of Employment

Sector of Employment	Median Earnings by Field of Employment				
	Engineering	Physical Science	Life Science	Social Science	All Scientists and Engineers
Primary Industry	$12,000	$11,500	$ 9,750	$12,180	$11,500
Manufacturing	11,000	11,000	10,400	13,500	11,160
University	10,950	11,500	11,900	11,660	11,500
Federal Government	11,800	11,200	10,500	10,792	11,000
All Sectors	11,248	11,000	10,000	10,800	10,950

Source: 1967 Survey of Scientists and Engineers.

(viii) Earnings and Work Function

The median earnings of the scientists and engineers vary considerably depending upon the type of work functions performed, (Table 4.33). Highest median earnings, $13,700, were reported by those who functioned primarily as administrators or managers. Managers and supervisors of R & D ranked second with median earnings of $13,500. Not surprisingly, industrial and management consulting were also highly remunerative work functions with median earnings of $12,120. Counselling and case work produced the lowest median earnings, $7,800.

Earnings for each work function also differed among the major fields of employment, (Table 4.33).

Work functions vary in both the responsibility level and technical skill required for their performance. Each function requires individuals with different educational qualifications, experience and ability. These differences in requirements are in turn reflected in earnings differentials between work functions. By ranking educational level, years of experience and median earnings for the major work functions (Table 3.34) it was possible to consider the relative importance of two of these variables in relation to the median earnings of the scientists and engineers.

It is interesting to note that the differences in earnings by work function appear to be related more to differences in experience rather than differences in education. For example, the percentage of post-graduate degrees held by scientists and engineers working in development is the same as that in administration and management. The earnings differential, however, is substantial. Median earnings for the former is $10,000 and for the latter, $13,700. There is a similar disparity in the amount of experience of the members of the two groups. 60% of the scientists and engineers in development had more than ten years experience while 86% of administrators and managers had this same experience. A similar relationship between earnings differential and years of experience is also evident for the other work functions.

This section has considered in detail the characteristics and deployment of scientists and engineers in Canada. The next chapter investigates in a similar manner various other types of highly qualified manpower in the fields of health, law and education.

TABLE

SCIENTISTS AND ENGINEERS WORKING
Median Earnings by Field of

Field of Employment	Administration and Management	Supervision
Engineering	$11,400	$11,700
Physical Science	15,000	12,000
Life Science	10,700	9,600
Social Science	13,700	9,000
All Scientists and Engineers	13,700	11,000

(a) Architects have not been included in this table because of the small numbers involved in some of these work functions. The two major functions of architects are (1) administration and management (function of 20%) and (2) design (prime function of 40%). Median earnings in the former were $12,600 and in the latter, $9,750.

Source: Appendix Table II.13.

4.33

FOR EMPLOYERS IN CANADA, 1967
Employment, by Work Function[a]

Work Function			
Industrial or Management Consulting	Research	Teaching	All Functions
$12,250	$10,300	$10,200	$11,248
11,000	11,000	10,500	11,000
10,000	10,500	10,200	10,000
12,850	10,700	10,400	10,800
12,120	10,500	9,600	10,900

TABLE

SCIENTISTS AND ENGINEERS WORKING
Work Function by Education, by

Work Function	Education	
	% of Post-Graduate Degrees	Rank
Research	66.7	1
Teaching	47.1	2
Management and Supervision of R & D	41.4	3
Development	16.2	4
Administration and Management	16.2	4
Design	13.4	6
Supervision	11.2	7
Sales	4.5	8
Production Operation and Maintenance	4.5	8

Source: 1967 Survey of Scientists and Engineers.

4.34

FOR EMPLOYERS IN CANADA, 1967
Experience, and by Median Earnings

Experience		Earnings	
% With More Than 10 Years Experience	Rank	Median Earnings	Rank
67.2	5	$10,500	5
59.0	7	9,600	9
87.5	1	13,500	2
60.0	6	10,000	6
86.2	2	13,700	1
50.5	9	9,750	8
72.9	3	11,000	3
71.6	4	10,500	4
58.3	8	10,000	7

CHAPTER 5

HEALTH, LAW AND EDUCATION MANPOWER

I. Introduction

In this chapter basic information is assembled on highly qualified manpower in the health occupations, in the legal profession and in education. The data is from several sources; differences in coverage arise therefore, as well as certain differences in the definitions used. Some of the tables, for example, refer to slightly different populations for the same type of manpower. In each case, however, the source of the material is identified and an explanation given of the difference.

The approach in this chapter is in principle the same as that taken in Chapter 4 except that were data is sparse or non-existent the corresponding analytical section is either smaller or omitted entirely. The following aspects are examined for each occupation:

(1) the total resources of highly qualified manpower in the occupation;

(2) the overall utilization of manpower in the occupation;

(3) the geographical distribution and mobility of manpower in the occupation within Canada;

(4) the earnings of manpower in the occupation.

II. Health Manpower

At the 1961 Census, 140 thousand persons were described as "health professionals". This corresponds to about 22% of the professional and technical class of census occupations. The largest single group was nurses followed by physicians and surgeons, pharmacists, dentists, and several other smaller professional groups, e.g. optometrists, (Figure 5.1). By 1969 the share of nurses in the above occupations taken as a group had increased from 67% to 75%. The increase in this share is a continuation of a trend observable over the last 70 years; since 1900, the nursing profession has expanded rapidly compared to other health occupations, (Figure 5.2).

The ratio between health professionals and the population over time also gives a picture of their relative size and their rates of growth. In 1961, there were many more nurses per head of the population than any other group, (Table 5.1). Even so, the ratio of nurses to population has declined faster than that for any other group since 1961.

TABLE 5.1

HEALTH PROFESSIONAL-POPULATION RATIOS IN CANADA, 1961 AND 1969[a]

Occupations	Professional-population Ratio	
	1961	1969
Nurses	1: 233	1: 151
Physicians and Surgeons	1: 857	1: 778
Pharmacists	1: 2,455	1: 2,371
Dentists	1: 3,335	1: 3,031
Optometrists	1: 15,262	1: 14,152

(a) Since the 1969 figures are not based on a Census there is not a strict comparability with the 1961 figures.

Sources: 1961: Census of Canada, 1961
1969: Chapter 5, see section on relevant occupation.

III. Physicians and Surgeons

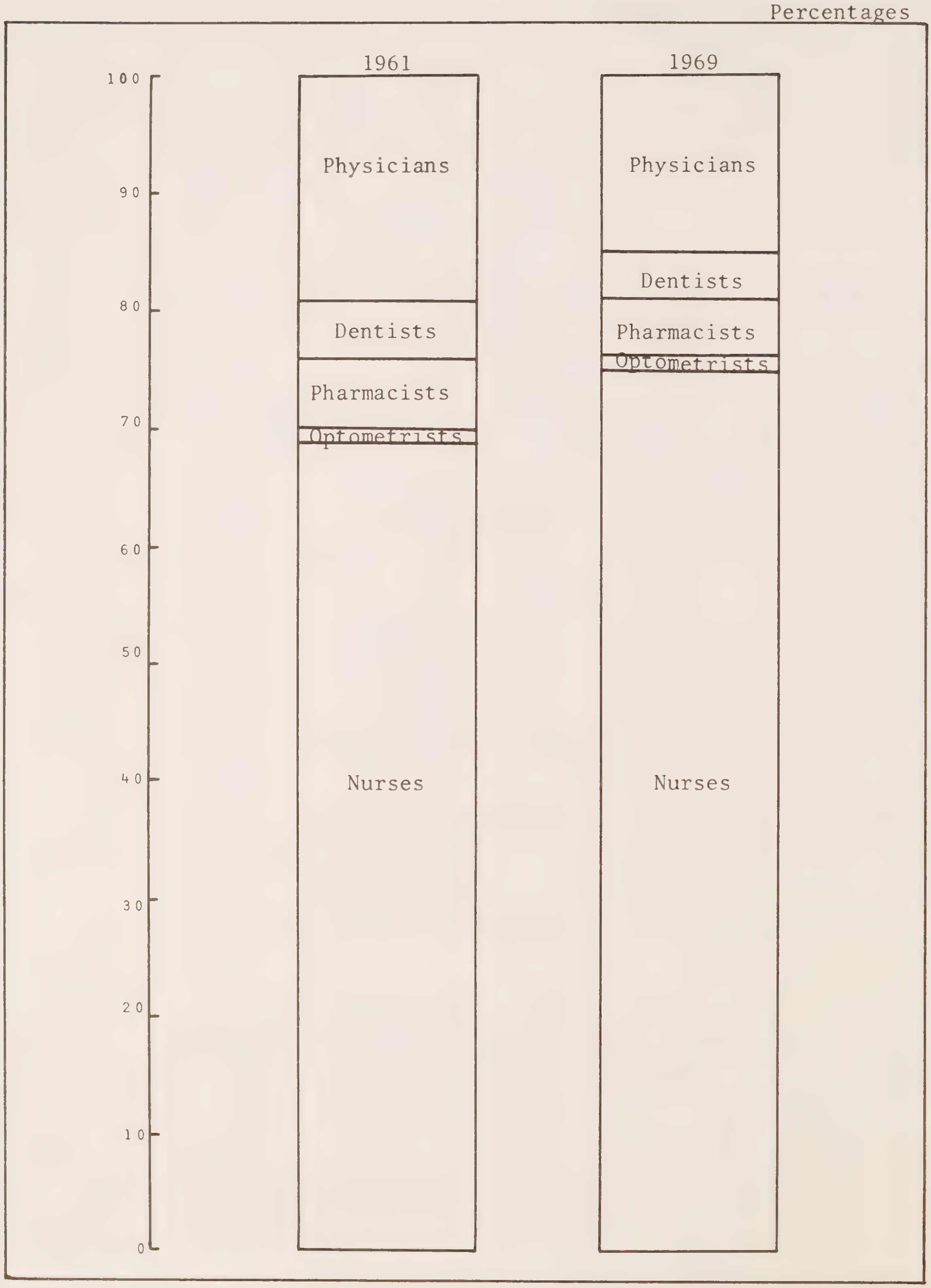
(1) Resources

At the beginning of 1969 there were estimated to be about 28 thousand physicians and surgeons active in Canada[1]. This is 7 thousand more

(1) Estimate from the Department of National Health and Welfare. This total is larger than the one given in Table 5.2 because it includes junior intern physicians who were not tabulated in the Department of National Health and Welfare data used in this report. Thus a lower total - 26,909 - is used in this report as the basic stock

FIGURE 5.1

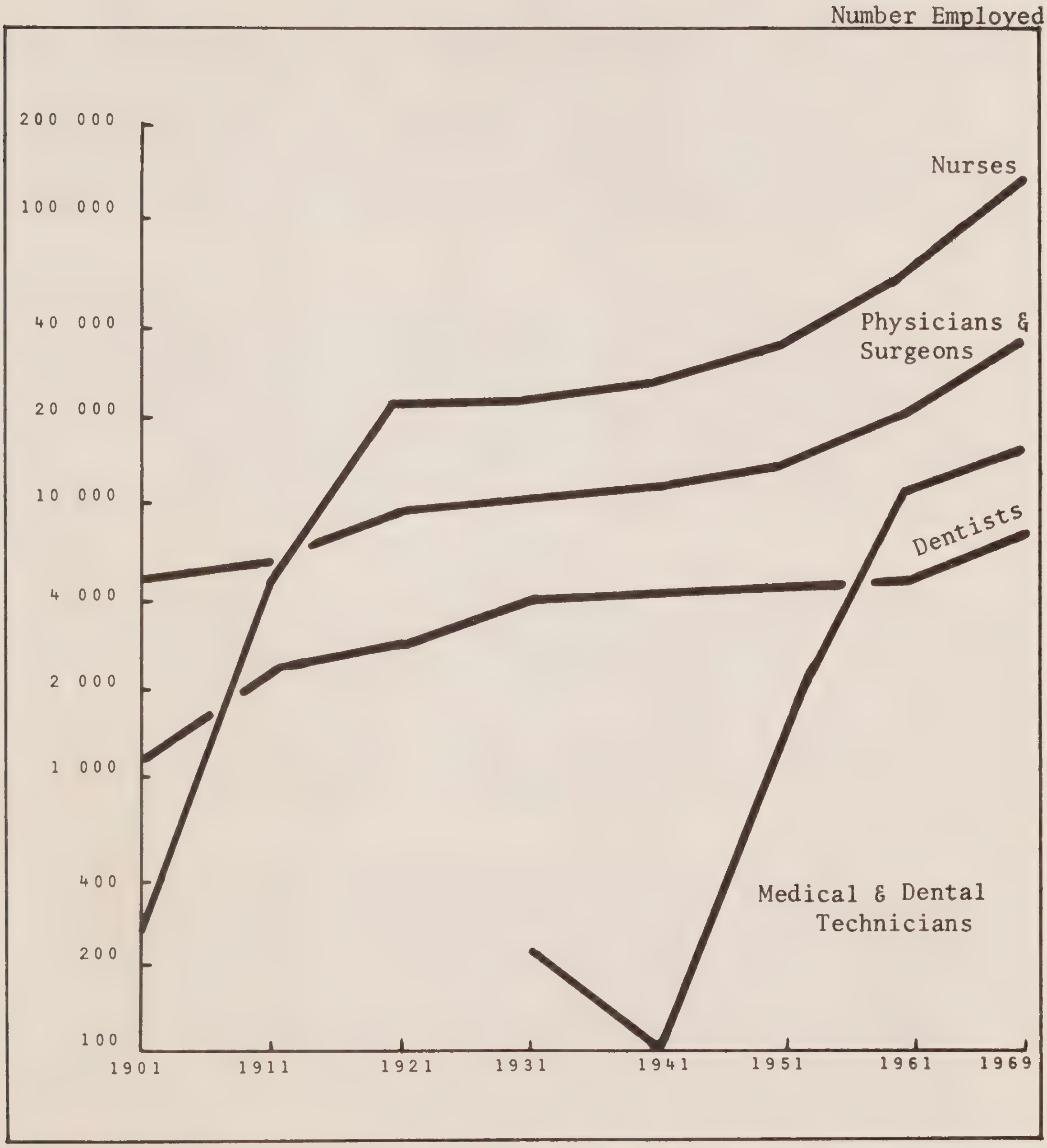
PROFESSIONAL MANPOWER IN SELECTED HEALTH OCCUPATIONS, 1961 AND 1969
By Size of Group



Source: "Health Manpower Inventory, 1969", Department of National Health and Welfare.

FIGURE 5.2

EMPLOYMENT IN SELECTED HEALTH OCCUPATIONS, 1901-69



Source: "Health Manpower Inventory, 1969", Department of National Health and Welfare.

than at the 1961 Census and is slightly above the number expected - on the basis of an assumed continuation of certain observed trends in physicians supply - by the Royal Commission on Health Services which reported in 1964[2]. The physician-population ratio has improved gradually over the last three decades, (Table 5.2), and this improvement is continuing. This ratio is at best only a crude guide in comparing the adequacy of the supply of physicians over a period of time; nonetheless on this measure the supply of physicians in Canada has improved between 1961 and 1969 at a faster rate than in the period 1951-61, and the physician "service" might be said to be above that expected by the Royal Commission for 1969.

(i) Age

In 1969, 61.7% of active physicians were under 45 years of age compared with 64% in 1961, (Figure 5.3). This represents a slight check in the trend towards a younger stock of physicians established since 1941. Physicians also appear to remain longer in practice than many other professionals; over 5% were still practising beyond age 65 compared with only 1.6% of university teachers and 1.5% of scientists and engineers.

(ii) Sex

The share of females in this profession has risen from 2.6% of the total in 1911 to nearly three times that proportion (6.8%) in 1961, (Figure 5.4). Since 1961, the share of females in the total of medical graduates has risen from 6.6% to about 10% in 1967-68.

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(1) cont'd

figure. There are, in fact, two sources of information on the stock of physicians and surgeons; the Department of National Health and Welfare are currently examining one source - namely the stock data from the Canadian Medical Directory (C.M.D.) tape obtained from Canadian Mailing Limited. The other source is the membership survey undertaken by the Canadian Medical Association in 1967. Data from the latter source is derived from respondents to the survey, and as such can only be used to examine special aspects of the use of physicians: the C.M.A. data cannot be used in examining total resources of physicians.

(2) Royal Commission on Health Services, 1964 - Volume I, Queen's Printer, page 525; Table 13-1.

TABLE 5.2

PHYSICIAN-POPULATION RATIOS IN CANADA
1901 - 1969

Year	Civilian Physicians and Surgeons[a] (thousands)	Total Population[b] (Millions)	Physician-Population Ratio
1901	5.48	5.32	1: 972
1911	7.41	7.19	1: 970
1921	8.71	8.78	1: 1,008
1931	10.02	10.36	1: 1,034
1941	11.87	11.49	1: 968
1951	14.32	13.98	1: 976
1961	21.29	18.24	1: 857
1969	26.91	20.94	1: 778

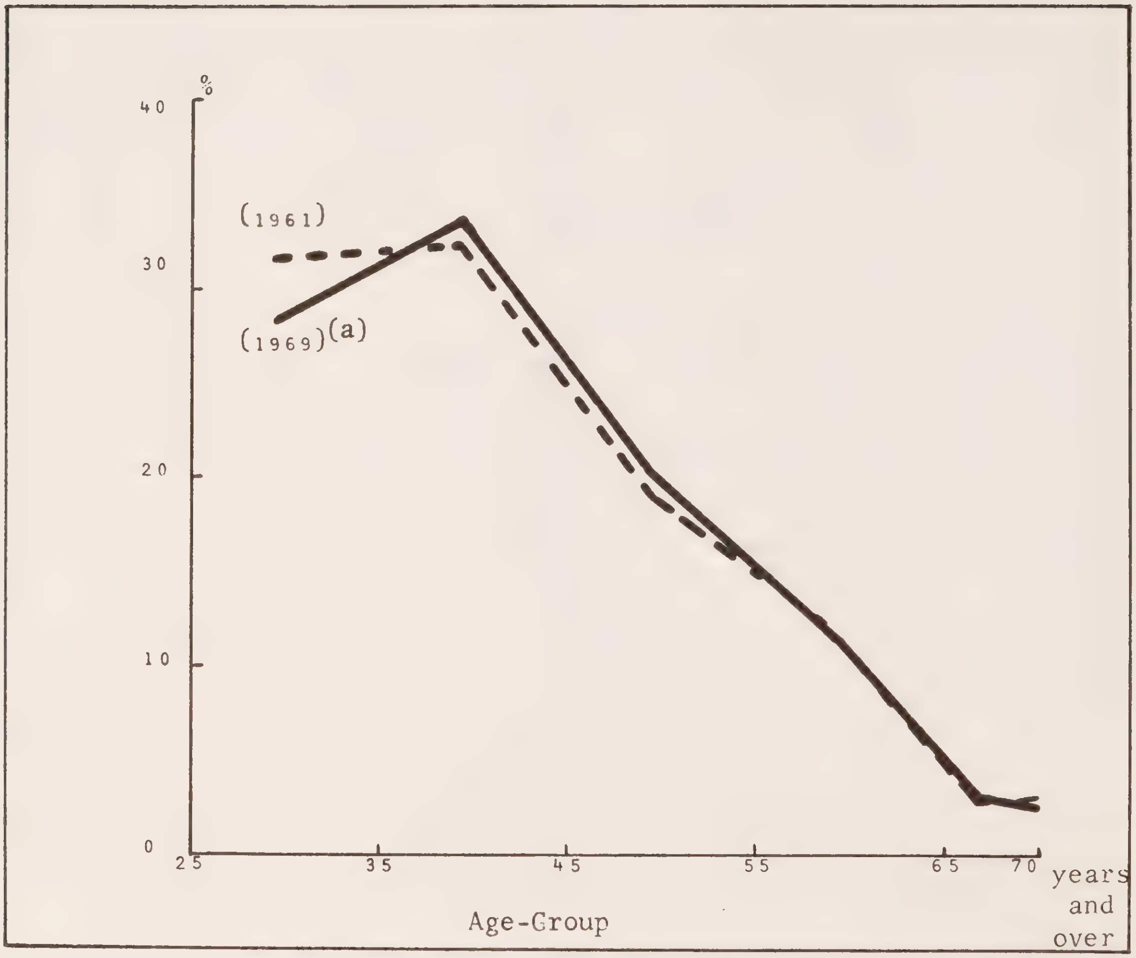
Note: The 1969 Physician-Population totals refer to slightly different dates: the population estimate is for June, 1968 whereas the physician estimate is for January 1969.

Sources: (a) Physicians and Surgeons -
1901-61 Census of Canada.
1969 Estimate by Department of National Health and Welfare based on Canadian Medical Directory.

(b) Population: Canadian Statistical Review, Vol. 44, No. 12, Table 1 and Censuses of Canada 1901-1961.

FIGURE 5.3

ACTIVE PHYSICIANS IN CANADA, 1961 AND 1969
By Age Group



(a) The age - distribution for 1969, was based on data showing years in practice since graduation and is not in the strictest sense comparable with that of 1961.

Sources: (1) 1961: Census of Canada, 1961
(2) 1969: Department of National Health & Welfare, Canadian Medical Directory Tape of Active Civilian Physicians in Canada as of January 8, 1969.

FIGURE 5.4

PHYSICIANS IN CANADA, 1911-1961
By Sex

Source: Data obtained from 1911-1961 Censuses of Canada.

(iii) Origin

Canada has relied heavily on immigrant physicians to maintain and increase the stock of medical manpower. Chapter 3 of this report showed that the supply of new entrant physicians from abroad has been rising faster than graduations from Canadian universities, and was greater in 1969 than the supply from Canadian medical schools. In the period 1950 to 1960 one-third of newly registered physicians in Canada came from other countries; the proportion has risen since then.

At the 1961 Census three-quarters of all physicians were shown to have originated in Canada; the largest single other source was the United Kingdom which had supplied nearly 8% of the stock.

The relative importance of the different countries of origin for physicians is reflected in the educational background of the stock. In 1969, 12% of all physicians were found to have received their education in British Commonwealth countries other than Canada, (Table 5.3).

TABLE 5.3

PHYSICIANS IN CANADA, 1969
By Country Where Medical Education Received

Country	Percentages
Canada	74.1
British Commonwealth	12.3
United States	0.5
Other	11.8
Total [(a)]	100.0

(a) Includes school unknown.

Source: "Health Manpower Inventory 1969," Department of National Health and Welfare.

The contribution of foreign medical schools to the Canadian physician stock varies greatly between provinces; 39% of physicians in Newfoundland were educated at Canadian medical schools compared with 86% in Quebec, and 75% in Ontario, (Table 5.4). The proportion of foreign educated physicians is highest in the lesser populated areas of Canada -

North West Territories and Yukon, Newfoundland and Saskatchewan. Newfoundland has the highest proportion of physicians who received their medical training outside Canada; 41% of Newfoundland physicians received their training in other British Commonwealth countries. A greater proportion of those physicians trained in the United States went to the Yukon and North West Territories than to any Canadian province.

TABLE 5.4

PHYSICIANS IN CANADA, 1969
By Province of Practice and by Country
Where Medical Education Received

Percentages

Province of Practice	Country Where Medical Education Received				
	Canada	British Commonwealth	United States	Other	Total [a]
Newfoundland	38.6	41.2	1.2	18.3	100.0
Prince Edward Island	72.5	12.1	0.0	8.8	100.0
Nova Scotia	66.3	15.1	0.3	16.3	100.0
New Brunswick	69.4	5.4	0.4	21.4	100.0
Quebec	85.9	1.7	0.3	11.3	100.0
Ontario	75.0	12.5	0.5	10.6	100.0
Manitoba	63.2	18.3	0.2	16.5	100.0
Saskatchewan	47.4	29.1	0.4	20.8	100.0
Alberta	62.6	25.4	0.6	9.6	100.0
British Columbia	70.4	18.6	1.7	8.9	100.0
Yukon & N.W.T.	44.8	31.0	3.5	20.7	100.0
CANADA	74.1	12.3	0.5	11.8	100.0

(a) Includes school unknown.

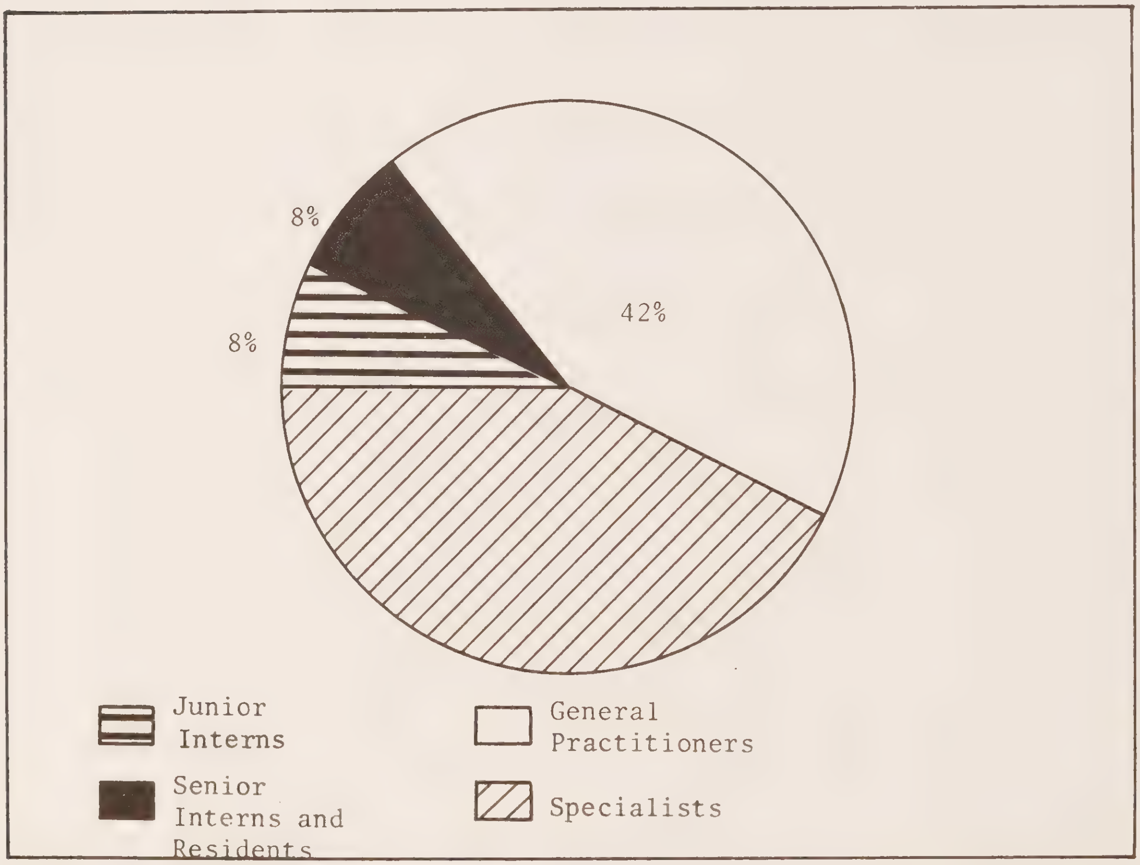
Source: "Health Manpower Inventory 1969", Department of National Health and Welfare.

(2) Utilization[1]

In 1968, 85% of all active physicians were engaged in practice in almost equal proportions as either general practitioners or specialists; the remaining 15% was made up by a residual group including interns, residents and those not registered, (Figure 5.5).

FIGURE 5.5

ACTIVE PHYSICIANS IN CANADA, 1968
By Type of Practice



Source: Based on data supplied by the Department of National Health and Welfare, Canadian Medical Directory Tape of Active Civilian Physicians in Canada as of January 8, 1969.

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(1) *It is not possible in this section to examine all the facets of the utilization of medical manpower; our purpose is to highlight some of the more important aspects of utilization for which some statistical information is available.*

An examination of the employment positions actually held by physicians gives a more detailed picture of the deployment of this type of manpower. Not all specialist physicians, for example, were in posts in which they were in direct contact with patients; nearly 5% of specialists were engaged in teaching in medical schools, (Table 5.5).

TABLE 5.5

ACTIVE PHYSICIANS[a] IN CANADA 1968
By Type of Practice and Appointment

Percentages

	Type of Practice		
	Interns and Residents	General Practitioners	Specialists
Medical Researcher	--	--	--
Teacher	--	1.3	4.4
Administrator (Government, Business or Industry)	--	8.0	4.0
Staff Physician (Hospital)	--	23.5	48.0
Medical Director	--	--	--
Employed in Practice or Hospital	99.0	66.2	43.5
Total	100.0	100.0	100.0

-- = less than 1%

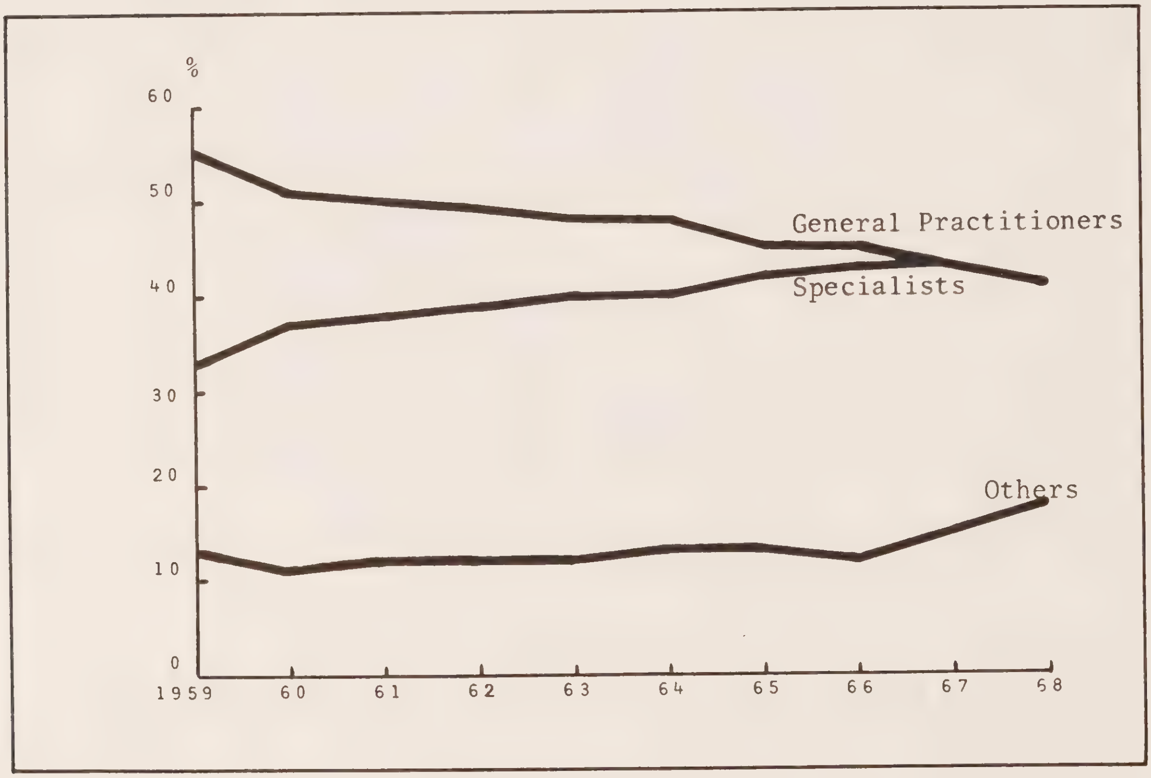
(a) Active physicians include registered and non-registered physicians.

Source: "Health Manpower Inventory 1969", Department of National Health and Welfare.

The proportion of physicians in general practice has declined rapidly over the last decade, (Figure 5.6), from 55% of the total stock in 1959 to 43% in 1968. Specialists have increased by as much as general practitioners have declined - from 33% of the total in 1959 to 42% in 1968.

FIGURE 5.6

GENERAL PRACTITIONERS AND SPECIALISTS IN CANADA, 1959-68
By Share of Total Medical Manpower



Source: "Health Manpower Inventory, 1969", Department of National Health and Welfare.

(i) Mode of Practice

According to a survey conducted by the Canadian Medical Association about 60% of all physicians in Canada work by themselves[1]. Another 30% are employed in group practice. In Ontario, Quebec, Nova Scotia and New Brunswick more physicians work by themselves than in group practice or together with another physician, (Table 5.6). In every province, more physicians favoured working as a group rather than working in combination with another physician. Solo work is, however, less pronounced amongst general practitioners than amongst specialists. In Ontario, for example, 62% of general practitioners were working by themselves compared with 65% of specialists; in British Columbia 41% of all G.P.'s worked alone compared with 58% of specialists.

(ii) Workload

An examination of the workload of physicians is of central importance in reviewing the utilization of medical manpower. Utilization is a complex concept to define in precise terms for highly qualified manpower. It involves, for example, some attempt at defining the "output" of specialized manpower such as physicians and although some very important steps have been taken in this direction[2] there is still no consensus of views on this problem. We can establish some basis however for measuring one aspect of physician "input" namely the number of patients seen over a period of time. This allows some rough estimate to be made of physician effort although there is no way of measuring what effect this has on the general level of health in the population.

It is interesting to find that workload varies to some extent between physicians. 10% of general practitioners worked less than 40 hours per

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(1) *The Canadian Medical Association (C.M.A.), in a survey of its membership in 1967, asked for a description of the physician's mode of practice, i.e. solo, two physicians, group. 5,000 general practitioners and the same number of specialists responded to this question on the survey and Table 5.6 is based on their replies. It must be noted that C.M.A. membership is not identical with the total stock of physician manpower.*

(2) *M. W. Reder "Some Problems in the Measurement of Productivity in the Medical Care Industry", p. 98, Production and Productivity in the Service Industries (edited by Victor R. Fuchs) National Bureau of Economic Research, New York, 1969.*

TABLE

PHYSICIANS IN
By Mode of

Mode of Practice	Nfld.	P.E.I.	N. S.	N. B.
Solo	47.5	48.4	68.4	69.9
2 Physicians	19.0	6.3	16.5	8.9
Group	34.8	50.0	17.9	25.2
Less duplications in modes of practice	-1.3	-4.7	-2.8	-3.9
TOTAL	100.0	100.0	100.0	100.0
Total Reporting	(158)	(64)	(430)	(282)

Source: 1967 Survey, Canadian Medical Association

5.6

CANADA, 1967
Practice and by Province

Percentages

Que.	Ont.	Man.	Sask.	Alta.	B. C.
71.0	63.4	39.7	32.7	38.4	49.9
19.7	13.0	12.8	21.6	16.7	16.2
23.0	25.3	49.4	48.4	46.5	35.0
-13.7	-1.7	-1.8	-2.8	-1.6	-1.2
100.0	100.0	100.0	100.0	100.0	100.0
(3,533)	(5,366)	(749)	(626)	(1,036)	(1,824)

week whilst 20% worked more than 70 hours a week[1]. 3.2% worked 90 to 100 hours per week. The heavy workload - in the 80-90-100 hours per week range - seemed to be concentrated in the Atlantic provinces. This pattern is not surprising; an analysis of geographical distribution shows that physicians are inequitably distributed in the Atlantic provinces in relation to the distribution of the total population, (Table 5.8). The heavier workload of general practitioners in the Atlantic provinces seems to bear this out.

There are also fairly wide divergences between physicians in the number of patients seen in the course of a week. 20% of general practitioners saw fewer than 80 patients per week; a further 20% saw more than twice that number, (Table 5.7).

TABLE 5.7

PHYSICIANS IN CANADA, 1967
By Province of Practice, by Number of Patients seen

Percentages

Province of Practice	Number of Patients seen in a Week			
	0 - 80	81 - 160	161+	Total
Newfoundland	12.0	62.7	25.4	100
Prince Edward Island	25.0	58.4	16.7	100
Nova Scotia	25.4	53.4	21.2	100
New Brunswick	26.5	53.0	20.5	100
Quebec	..	..	..	..
Ontario	20.7	57.3	22.0	100
Manitoba	31.7	52.2	16.1	100
Saskatchewan	22.6	62.4	15.1	100
Alberta	15.5	61.4	23.1	100
British Columbia	15.6	61.3	23.2	100
CANADA	20.6	58.2	21.1	100

.. = Not available
Source: 1967 Survey, Canadian Medical Association

Specialists, on the other hand, tend to see fewer patients than are seen by general practitioners and there was not as much divergence between specialists in the numbers seen. Thus, 55% of specialists saw up to 80 patients a week; another 37% saw between 80 and 160, and only 8% saw over 160.

(1) *C.M.A. Manpower Survey.*

(3) Geographical distribution

Although the supply of physicians has increased in recent years bringing about an improvement in the national physician-population ratio, the distribution of physicians between provinces remains uneven, (Table 5.8).

TABLE 5.8

PHYSICIAN-POPULATION RATIOS IN CANADA
By Province, 1941-69

	1941 (a)	1951 (a)	1961 (a)	1969 (b)
Newfoundland	..	1: 2,524	1: 1,991	1: 1,484
Prince Edward Island	1: 1,418	1: 1,342	1: 1,149	1: 1,209
Nova Scotia	1: 1,350	1: 1,094	1: 1,044	1: 829
New Brunswick	1: 1,693	1: 1,445	1: 1,314	1: 1,096
Quebec	1: 1,054	1: 990	1: 853	1: 770
Ontario	1: 903	1: 857	1: 776	1: 749
Manitoba	1: 1,108	1: 926	1: 823	1: 743
Saskatchewan	1: 1,700	1: 1,278	1: 973	1: 900
Alberta	1: 1,320	1: 1,118	1: 982	1: 781
British Columbia	1: 1,010	1: 847	1: 758	1: 686
Yukon & North-West Territories	..	..	..	1: 1,586
Canada	1: 1,072	1: 976	1: 857	1: 778

.. = Not available.

Sources: (a) 1941-51-61: "Medical Manpower in Canada, 1964," Royal Commission on Health Services, Table 2-3 p. 27.

(b) "Health Manpower Inventory 1969," Department of National Health and Welfare.
Canadian Statistical Review, Volume 44 No. 12.

Thus Ontario, Nova Scotia, Quebec and Manitoba are grouped together slightly below the national average of 1:778. Other provinces - notably Newfoundland, Prince Edward Island and the North West Territories - have ratios approaching twice the national average. Many factors probably influence the distribution of physicians between provinces; the absence or presence of medical schools in particular provinces will affect the supply of physicians in that province; the level of personal income in the provincial population will influence the demand for physician services in that province; the availability of outpatient departments in hospitals will affect the demand for physician services in particular areas.

Nonetheless, there has been some equalization in the distribution of physicians. New Brunswick experienced an improvement of over one-third in its ratio since 1941; Saskatchewan has almost doubled the number of physicians and in 1969, British Columbia had the most physicians relative to its population of all provinces.

IV. Dentists

(1) Resources

Canada had 6,582 dentists in 1967. The increase in the number from 6 thousand in 1963 was high compared with previous years. Between 1931 and 1966, the stock of dentists increased by only 60% while the Canadian population almost doubled. As a result, there has been a reduction in the national dentist-population ratio over the last three decades. Thus, in 1966 there were about 25% more people per dentist than in 1931. Improvements in the science of dentistry and dental technology may have increased the dentist's productivity over the period, and thereby ameliorated the adverse effects of a reduced dentist-population ratio on the volume of dental health care available to Canadians.

(i) Age

Canada's stock of dental manpower became younger between 1962 and 1966. The mean age of dentists declined from 46 to 44 years over this period.

(ii) Sex

Dentistry in Canada remains almost exclusively a male profession; there were only 142 women dentists in 1966. There has been however, a gradual increase in female participation in recent years; females comprised 2.2% of the profession in 1966 compared to 1.6% in 1962.

(iii) Origin

Almost all dentists practising in Canada have taken their main dental qualifications in Canadian dental schools; only 459 dentists out of a stock of 6,582 in 1967 had obtained their qualifications from dental schools outside Canada. "In part this is a result of the various provincial regulations for dental licensure which makes it difficult for most dentists migrating to Canada to obtain a licence to practise without first attending a Canadian dental school for at least two years"[1]. The situation is unlikely to have changed very much since 1964.

Only 89% were actually born in Canada; 3% came from the United States and 2% from the United Kingdom (the other main countries of origin). It is likely that many of these foreign-born dentists received some education before coming to Canada, and were possibly requalified as dentists on reaching Canada. In general, however, dentistry in Canada does not rely on immigration as a source of supply to a very great extent.

(2) Utilization

The typical Canadian dentist is self-employed; 90% of all full-time dentists in 1967 were engaged in private practice and most of the remainder were employed in salaried positions in government and in university dental schools, (Table 5.9).

Of the 366 part-time dentists most were employed in private practice; it is likely that many of these also had salaried part-time positions with university dental schools.

One of the most striking features of employment in the health manpower field is the growth of specialization. In dentistry this growth has been controlled, to some extent, by the policy of the professional association and provincial jurisdiction. The actual certification of specialists, for example, is a matter of provincial jurisdiction and the number of certifiable specialties differs from province to province. Newfoundland recognizes no specialties while some provinces certify as many as six. The Canadian Dental Association now recognizes six specialties, three more than in 1962.

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(1) "Dental Manpower in Canada", Royal Commission on Health Services, 1964, p. 20.

Paedodontics, periodontics, oral surgery and orthodontics are the most important specialties. As Figure 5.7 illustrates, most specialists practice in one of these fields. Orthodontics, alone, comprised over one-half of all dental specialties in 1968. There is, however, a trend to a wider dispersal of specialists among the increasing number of specialties since 1962. Thus, the two principal specialties, orthodontics and oral surgery, accounted for four-fifths of all specialties in 1962 but only three-fifths in 1968.

TABLE 5.9

DENTISTS IN CANADA, 1967
By type of employment

Type of Employment	Full-time	Part-time
Self-employed	5,570	342
Salaried (in private practice)	52	24
Federal Government	216	2
Provincial Government	65	10
Municipal Government	110	33
University Dental School	98	263
Other	35	57
Total[(a)]	6,146	366

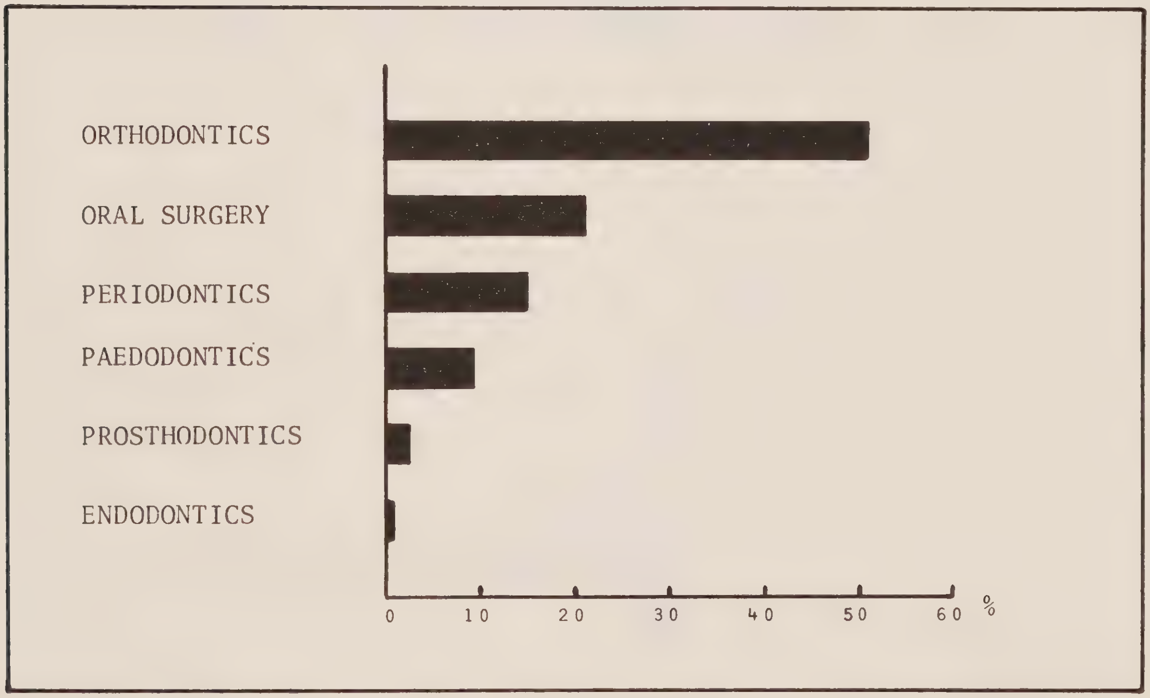
(a) Items do not add to total for part-time dentists since part-time practitioners can work both in private practice and in some other field.

Source: Canadian Dental Association.

In 1968 there were 347 dental specialists in Canada compared to 277 in 1962. 5% of licensed dentists were specialists in 1968 compared to 2% in 1952. Dental specialists are even more unevenly distributed between the provinces than dentists. In 1968, half of all the Canadian dental specialists were practising in Ontario. The combined total of specialists in the four most deficient provinces, Prince Edward Island, Newfoundland, New Brunswick and Saskatchewan, was less than the 11 specialists in Nova Scotia. Any marked change in this distribution is

FIGURE 5.7

PERCENTAGE DISTRIBUTION OF DENTAL SPECIALISTS, 1968
By Specialty



Source: Canadian Dental Association.

FIGURE 5.8

DENTAL SPECIALISTS, 1962 AND 1968
By Province

Source: Canadian Dental Association.

unlikely, since specialists tend to practice in urban centres close to dental schools. In 1962, about four-fifths of all dental specialists practiced in cities of 250,000 or more. In 1966 none of the aforementioned provinces had a city of this size nor a dental school.

(3) Geographical distribution

Most dentists practice in the heavily populated provinces. In 1966, about two-thirds of all dentists practiced in Quebec and Ontario. After allowing for interprovincial differences in size of population, we find that dentists are still unequally distributed between the provinces. As a result, the supply of dental health service, as measured by the dentist-population ratio, varies markedly from province to province. A comparison of interprovincial dentist-population ratios for 1966 shows that residents in British Columbia and Ontario can call on a larger supply of dentists than other provinces. The supply of dentists relative to population in Ontario is about five times greater than that in Newfoundland and almost twice that of New Brunswick. Outside British Columbia and Ontario, the supply of dental health service was greatest in the Prairies.

V. Optometrists

(1) Resources

The number of optometrists practicing in Canada has remained almost constant over the last two decades. There were 1,488 active licensed optometrists in 1968 - only three more than in 1950. There was a decline in the fifties but this was reversed by 1960 after which the stock increased at 0.4% annually. About 3% of optometrists are women. No information is available about the age-distribution of optometrists.

The stable numbers of optometrists and the growing population have brought about a significant reduction in the optometrist-population ratios in Canada - from one optometrist to 9,200 persons in 1950, to one to 13,900 in 1968, (Table 5.11). It must be noted, however, that practitioner-population ratio is not a very good indicator of the availability of service in this particular field: opthalmologists are able to perform refractions and other optometric services and this factor can clearly increase the supply of optometric services.

(i) Origin

Most optometrists practising in Canada are Canadian-born and were trained in Canada. Only 7.2% of the 1968 stock had been trained outside Canada - mainly in the United States, (6%) and United Kingdom, (1%).

TABLE

DENTISTS AND DENTIST-POPULATION
By Province

	DENTISTS			
	1963		1966	
	No.	Per Cent	No.	Per Cent
Newfoundland	41	0.7	40	0.6
Prince Edward Island	31	0.5	31	0.5
Nova Scotia	191	3.2	201	3.1
NewBrunswick	133	2.2	129	2.0
Quebec	1,404	23.4	1,507	23.2
Ontario	2,515	41.9	2,780	42.8
Manitoba	321	5.4	313	4.8
Saskatchewan	197	3.3	210	3.2
Alberta	459	7.6	504	7.8
British Columbia	704	11.7	774	11.9
Yukon and N.W.T.	4	0.1	5	0.1
Canada	6,000	100.0	6,494	100.0

Source: Canadian Dental Association.

5.10

RATIOS IN CANADA, 1963 AND 1966

	DENTIST-POPULATION RATIOS	
	1963	1966
	(population per dentist)	
Newfoundland	1: 11,610	1: 12,325
Prince Edward Island	1: 3,484	1: 3,516
Nova Scotia	1: 3,932	1: 3,761
New Brunswick	1: 4,579	1: 4,783
Quebec	1: 3,904	1: 3,836
Ontario	1: 2,577	1: 2,504
Manitoba	1: 2,956	1: 3,076
Saskatchewan	1: 4,736	1: 4,548
Alberta	1: 3,057	1: 2,903
British Columbia	1: 2,413	1: 2,421
Yukon and N.W.T.	1: 8,750	1: 8,600
Canada	1: 3,155	1: 3,082

TABLE 5.11

OPTOMETRISTS AND OPTOMETRIST-POPULATION RATIOS
IN CANADA - 1950, 1955, 1960 AND 1968

Year	Active Licensed Optometrists	Optometrist-Population Ratios
1950	1,485	1: 9,200
1955	1,457	1: 10,800
1960	1,411	1: 12,600
1968	1,488	1: 13,900

Source: Provincial Optometrist Licensing Authorities

(2) Utilization

The typical optometrist in Canada is self-employed. In 1968, 94.1% of all optometrists in Canada were self-employed, (Table 5.12). Nine out of every ten of these self-employed optometrists were in individual practice. Among the 5.9% with employee status about two-thirds worked on a straight salary basis and the remainder for salary and commission.

There are marked differences in both employment status and mode of practice between provinces. For example, partnership practice was considerably more common in the Western provinces, (excluding Manitoba) where one-quarter of optometrists practised under the partnership arrangement, but such arrangements were rare in the Maritimes. While Manitoba had three times more optometrists working for straight salaries relative to the nation at large, Prince Edward Island and New Brunswick had no salaried optometrists.

Optometrists, like other health professionals examined in this study, are concentrated in the more populated, more urbanized and more prosperous provinces. In 1968, about 70% of all optometrists were practising in Ontario and Quebec. Quebec and Alberta, (Table 5.13), had the lowest optometrist-population ratios among the provinces. Ontario, which had the lowest ratio in 1950, 1955 and again in 1960, fell to third place in 1968. The Atlantic provinces generally had the highest optometrist-population ratios.

TABLE 5.13

OPTOMETRIST - POPULATION RATIOS, 1950, 1955, 1960 and 1968
By Province and for Canada

Population in thousands

Province	Optometrist-Population Ratios			
	1950	1955	1960	1968
Newfoundland	1: 50.1	1: 58.0	1: 76.5	1: 33.8
Prince Edward Island	1: 9.6	1: 10.0	1: 20.6	1: 22.0
New Brunswick	1: 12.5	1: 13.7	1: 15.4	1: 15.6
Nova Scotia	1: 14.2	1: 17.1	1: 19.0	1: 19.5
Quebec	1: 10.8	1: 11.9	1: 12.4	1: 12.3
Ontario	1: 6.7	1: 9.1	1: 11.4	1: 14.1
Manitoba	1: 11.6	1: 13.1	1: 15.2	1: 16.7
Saskatchewan	1: 19.4	1: 12.9	1: 13.0	1: 14.8
Alberta	1: 8.2	1: 9.5	1: 11.4	1: 12.3
British Columbia	1: 8.7	1: 8.8	1: 11.6	1: 14.4
CANADA	1: 9.2	1: 10.8	1: 12.6	1: 13.9

Source: Provincial Optometrist Licensing Authorities.

TABLE

OPTOMETRISTS IN
By Province, Employment Status

Province	Self-Employed	
	Proprietorship	Partnership
Newfoundland	80.0	10.0
Prince Edward Island	100.0	0.0
Nova Scotia	87.4	0.0
New Brunswick	100.0	0.0
Quebec	86.0	11.0
Ontario	86.1	7.2
Manitoba	76.7	6.7
Saskatchewan	67.5	30.2
Alberta	68.7	20.9
British Columbia	75.8	21.2
CANADA	81.8	12.3

Source: Report of a Fees and Economic Survey of Canadian Optometry, May 1969. Canadian Association of Optometrists.

5.12

CANADA, 1968
and Mode of Practice

Percentages

	Employees		Total
	Salaried	Salaried and Commission	
Newfoundland	10.0	0.0	100.0
Prince Edward Island	0.0	0.0	100.0
Nova Scotia	6.3	6.3	100.0
New Brunswick	0.0	0.0	100.0
Quebec	2.4	0.6	100.0
Ontario	3.8	2.9	100.0
Manitoba	13.3	3.3	100.0
Saskatchewan	2.3	0.0	100.0
Alberta	7.5	3.0	100.0
British Columbia	1.5	1.5	100.0
CANADA	4.0	1.9	100.0

VI. Pharmacists

(1) Resources

There were 10,585 licensed pharmacists in Canada in 1967. This was an increase of about one-third on the 1957 figure and represented an annual growth rate of 2.9% for the decade. However, only an estimated 88.2% of practising pharmacists are licensed(1). Thus, there were some 12 thousand pharmacists (licensed and non-licensed) practising in Canada in 1967.

(i) Age

Demographic information on the pharmacy manpower is not available for recent years; the most recent information relates to 1962(2). Between the ages of 26 and 55 pharmacists are not concentrated in any particular age-range, (Figure 5.9). Thus roughly one-quarter of the stock are aged between 26 and 35; a further quarter, 36-45 and a final quarter, 46-55. Only 5% of pharmacists are aged below 25.

(ii) Sex

The proportion of female pharmacists increased from 8% in 1955 to 11% in 1962. The male pharmacist was generally older than his female colleague. In 1962, the median age for male pharmacists was 42 compared with 34 for female pharmacists.

(iii) Origin

Pharmacists are mainly Canadian born. In 1961 nearly 90% of all pharmacists had been born in Canada. The United Kingdom was the largest single contributor of all other countries, accounting for 3% while the United States was the birthplace of some 2%.

(2) Utilization

Most pharmacists are engaged in retail pharmacy. Over four-fifths of all pharmacists are employed in this field for which licensure is a prerequisite for practice. Two-thirds of retail pharmacists are

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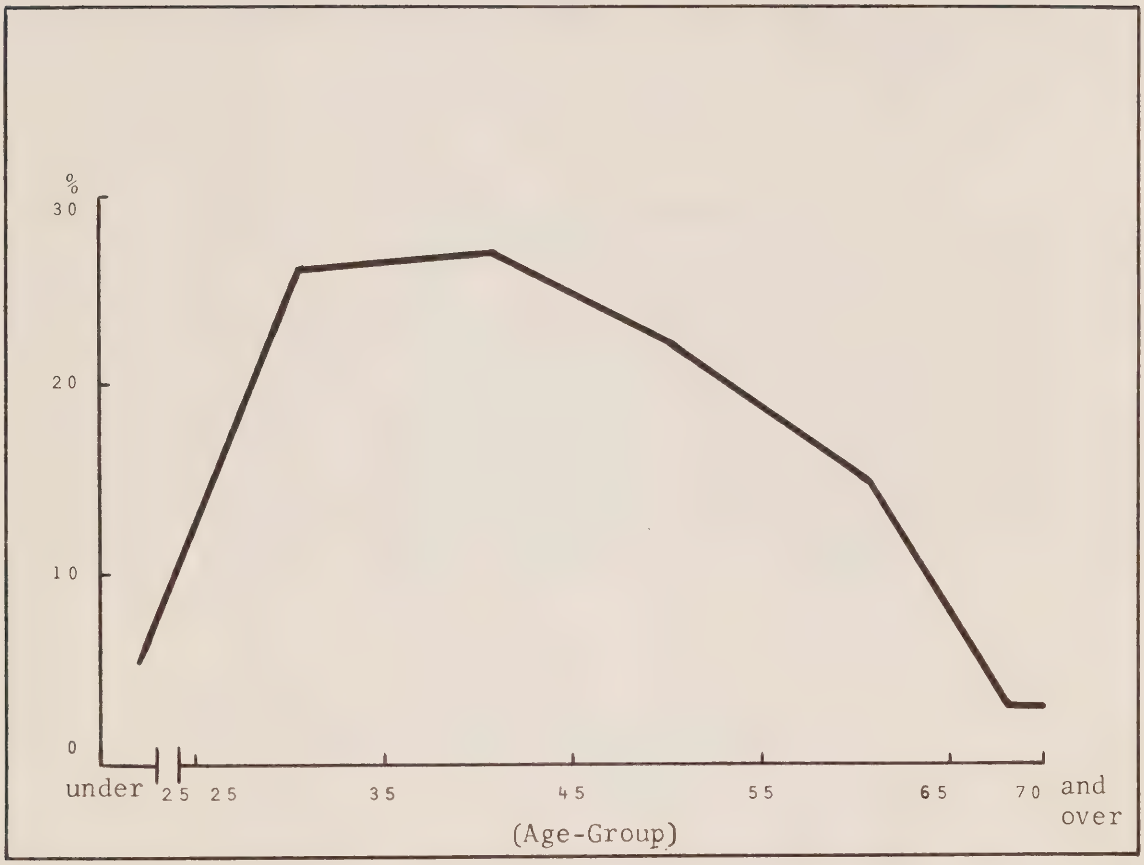
(1) Thomas M. Ross, "Pharmacy Manpower in Canada", Royal Commission on Health Services.

(2) Ibid.

FIGURE 5.9

PHARMACISTS IN CANADA, 1962
By Age



Source: "Pharmacists Survey, Pharmacy Manpower in Canada, 1962." Royal Commission on Health Services, p. 51.

self-employed. About one in every fourteen pharmacists works in the pharmaceutical manufacturing industry while about the same proportion are employed in hospitals. Government, (including the armed forces) and universities jointly absorb one-fortieth of available pharmacist manpower in Canada, (Table 5.14).

TABLE 5.14

PHARMACISTS IN CANADA, 1962
By Type of Employment[a]

Percentages

Type of Employment	
Retail	82.7
Manufacturing	7.5
Hospital	7.1
Government[b]	1.4
University	1.1
Other	0.2
TOTAL	100.0

(a) Assumes 'not stated' to have same distribution as those reporting type of employer.

(b) Includes Armed Forces.

Source: Based on Ross, op. cit.

As far as the actual work is concerned, about 90% of all pharmacists appear to be employed in dispensing drugs, (Table 5.15). This figure, however, may be somewhat inflated since it is based on the assumption that all pharmacists in retail trade are employed in dispensing work. Pharmacist owners of large pharmacies may be primarily engaged in management or administration.

The next important function is sales (for pharmaceutical manufacturers) which occupies one out of every twenty pharmacists. Administration as such is the prime work function of only 2.3%. The importance of this function may be understated, to an unknown degree, as discussed above.

Three functions; production and inspection, research, and teaching, together absorb the remaining 2.4% of pharmacists. The small proportion having research as primary work function, 0.7%, attests to the low volume of pharmaceutical research being conducted in Canada and to the scope of a substitution between pharmacists and other physical scientists, e.g. pharmacologists, pharmaceutical chemists in pharmaceutical research.

(3) Geographical distribution

Like other professionals in the health field, pharmacists are heavily concentrated in three provinces - Ontario, Quebec and British Columbia. These provinces accounted for almost three-quarters of all licensed pharmacists in 1967. The highest concentration of licensed pharmacists was in Ontario but was not as great as in past years. In 1967, two out of every five of Canada's licensed pharmacists practised in Ontario as compared to almost one out of two in 1957. From 1957 to 1967, the stock of licensed pharmacists increased most rapidly in Newfoundland (by 90% over the 10 years), Alberta (by 85%) and Quebec (by 79%) compared with 32.5% for Canada as a whole. British Columbia (37.0%) was the only other province registering an increase above the national figure; for Ontario, the increase was 17.7%.

TABLE 5.15

PERCENTAGE DISTRIBUTION OF PHARMACISTS - 1962
By Work Function

Work Function	Per Cent
Administration	2.3
Research	0.7
Teaching	0.6
Production and Inspection	1.1
Sales[(a)]	4.8
Dispensing[(b)]	90.5
Total:	100.0

(a) Includes salesmen in the pharmaceutical industry only.

(b) Includes pharmacists in retail trade, hospital (excluding pharmacist administrators) and armed forces.

Source: Based on Ross, op, cit.

There are large variations in the licensed pharmacists-population ratios between the provinces. In 1967, the ratio of licensed pharmacists to population ranged from one pharmacist to 1,270 in Alberta to one to 3,723 in New Brunswick. In general, the Western provinces and Ontario had fewer people per pharmacist - suggesting a relatively greater availability of pharmaceutical service - than in Quebec and the Atlantic provinces. However, these inter-regional disparities in the licensed pharmacists-population ratios became slightly less marked over the decade.

VII. Nurses

(1) Resources

There were an estimated 138 thousand registered nurses in Canada in 1968 compared to 127 thousand in 1967 and 94 thousand in 1962, (Figure 5.10). Canada's resources of nurses increased at the very rapid annual rate of 6.4% between 1962 and 1968. The number of nurses actually employed, however, is much smaller than the estimated number of registered nurses. In any given year, about one-fifth of all qualified registered nurses are not in employment. This aspect is examined more closely in the section on utilization.

(i) Age

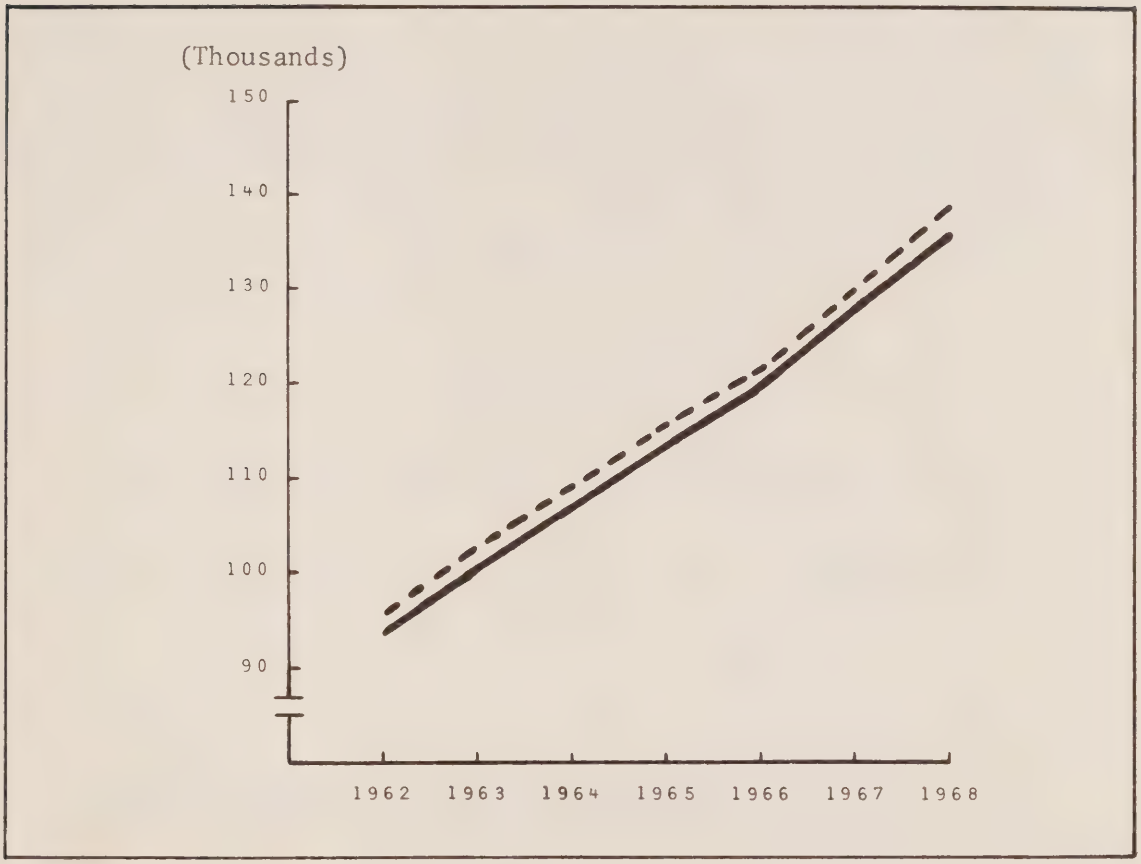
A high proportion of the nursing stock is concentrated in the younger age-groups, especially age 25-34, compared with other occupations considered in this report. Only primary school teaching had a higher proportion of the stock in the 25-34 age-group. Of those employed in nursing, the median age was 32. This varied considerably between nurses in different types of employment. For example, the median age of nurses working in hospitals, (31) was much lower than nurses employed in the public health field, (38). Nurses in the School Health field were older still, median age 43, with the highest median age of nurses found in occupational health and private practice.

(ii) Sex

Nursing is almost exclusively a female occupation: of all employed nurses in Canada in 1967, less than 1% were male. Male nurses were employed in all fields of nursing and 79% worked in hospitals or other institutions. Although they are few in number many male nurses succeed in reaching fairly senior positions: 6% of male nurses were classified as Directors or Assistant Directors compared with 3%

FIGURE 5.10

NURSES IN CANADA, 1962-68
Estimated Numbers and Actual Registrations [a]



(a) Straight line: Estimated Number of Nurses
Broken line : Actual Nurse Registration

The difference between the two series represents multiple registrations; these comprise about two per cent of total nurse registration

Source: Based on data supplied by the Canadian Nurses' Association. This estimate of the professional nursing stock is based on annual nurse registrations with the ten legally approved bodies for registering professional nurses in Canada.

of female nurses in this position. 15% of male nurses were in the supervisory category compared with 6% of female nurses(1).

(iii) Origin

Most nurses employed in Canada are Canadian born, (Table 5.16). At the 1961 Census, about one-fifth of all nurses were recorded as being born outside Canada. The United Kingdom as with primary and secondary school teachers, and physicians - was the largest single source of new supply of nurses from outside Canada.

TABLE 5.16

NURSES IN CANADA, 1961
By Country of Origin

Country of Origin	Percentages
United Kingdom	7.8
United States	1.7
Canada	82.3
Other	8.2
Total	100.0

Source: Census of Canada, 1961.

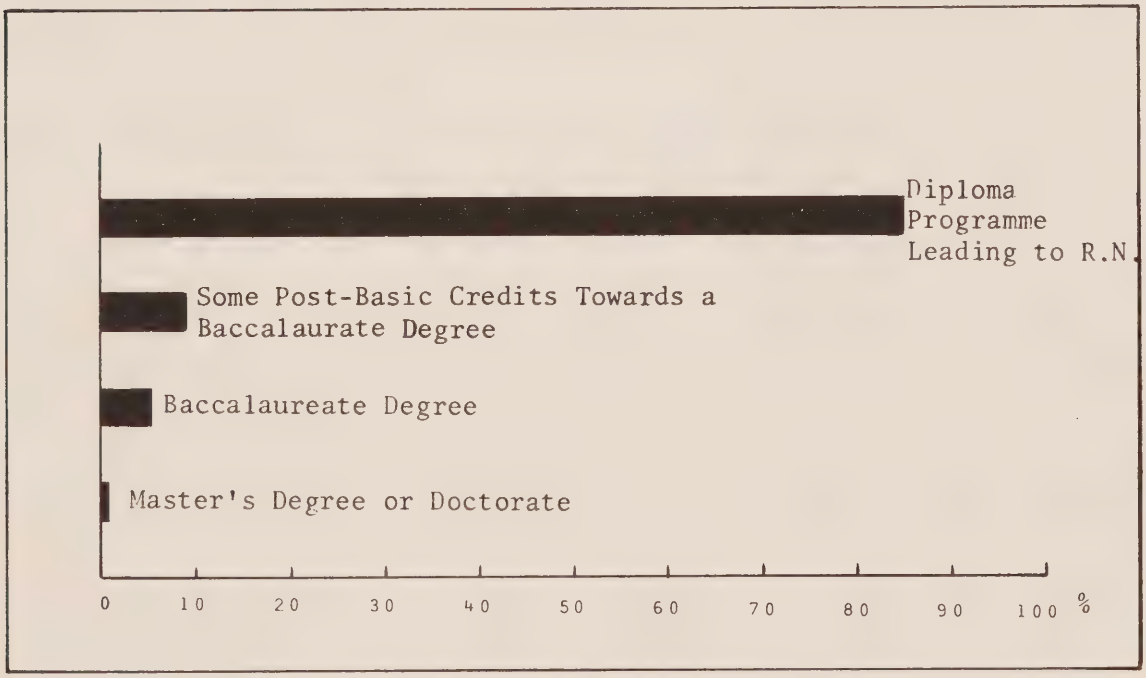
(1) *Information from Canadian Nurses' Association, "Countdown", 1968.*

(iv) Education

The formal education of most nurses stops with the completion of registered nurse training in a hospital school of nursing. Thus, in 1968, 85% of registered nurses gave the nursing diploma as their highest educational level, (Figure 5.11). A further 9% had taken some basic credits towards a baccalaureate degree (this group would include those nurses completing the post-basic university diploma or certificate programme). Slightly more than 5% of nurses had a university first degree whilst only 0.5% had a master's or doctoral degree. In 1967, about one-fifth of those with master's and all those with doctorates were awarded these degrees for study in the social sciences, humanities and other non-nursing fields.

FIGURE 5.11

REGISTERED NURSES IN CANADA, 1967
By Highest Level of Education Attained



Source: "Countdown" 1967
Canadian Nurses Association.

(2) Utilization

Of all qualified registered nurses in Canada, about 20% in any one year are not actually employed in nursing(1). Of these, 84% are married. It seems likely, therefore, that domestic responsibilities may be a main reason why a registered nurse is not occupied in normal nursing duties. No information is available on the rate at which qualified nurses not employed as nurses return to nursing or on where else they are employed if at all. Clearly their numbers constitute a major source of reserve supply to the employed nursing stock.

(i) Employment

84 thousand of the 120 thousand registered nurses in Canada in 1967 were also employed. Of these 25% were employed on a part-time basis. Nurses in the highest post of responsibility of Director or Assistant Director were mainly employed on a full-time basis, but 12% of Supervisors were employed part-time as well as nearly 6% of Head Nurses. Almost one-third of general duty or staff nurses were employed part-time.

80% of all employed nurses worked in hospitals in 1967. Public health accounted for 6%, private practice for almost 4% and physician's and dentist's offices for 2%. There was some difference between part-time and full-time nurses in each type of employment, (Table 5.17).

Private practice is four times as large an employer of part-time as opposed to full-time nurses while schools of nursing and the public health field employ more full-time than part-time nurses.

(ii) Work Function

Slightly more than 70% of all nurses are employed in general duties or as staff nurses, (Figure 5.12); 3% are employed as Directors of Nursing. Most of these posts were in hospitals, while nearly 12% hold positions as Head Nurses. A high proportion of Directors (73%) have no qualification at degree level. This varies to some extent between the different types of employment; thus in schools of nursing over two-thirds of Directors had an academic degree while in hospitals and institutions, only 20% possessed this qualification.

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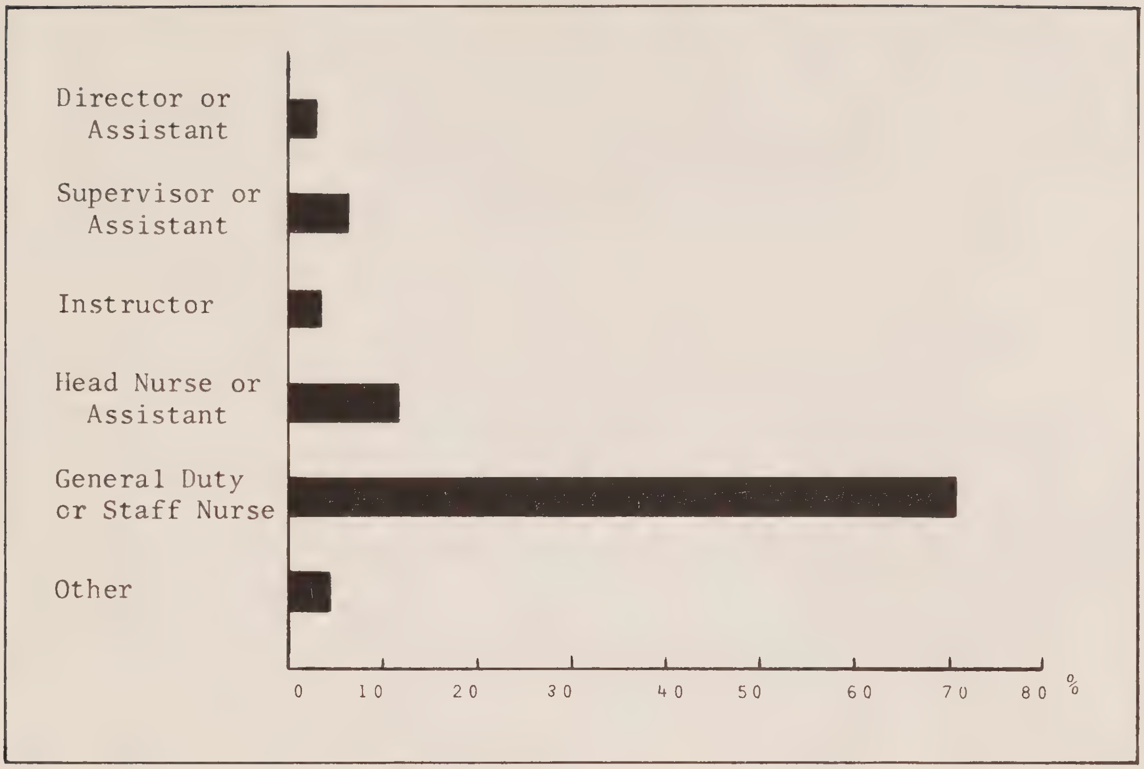
(1) *It is not possible to determine where these registered nurses are actually employed; they may work in a field closely related to nursing for which registration is necessary.*

FIGURE 5.12

NURSES IN CANADA, 1967
By Position Held in Employment



Source: "Countdown" 1967, Canadian Nurses' Association.

TABLE 5.17

EMPLOYED NURSES IN CANADA, 1967
By Field and Status of Employment

Percentage

Field of Employment	Employment Status		
	Full-Time	Part-Time	Total
Hospital or other Institution	73.6	26.4	100
School of Nursing	93.3	6.7	100
Private Practice	41.1	58.9	100
Public Health	88.1	11.9	100
School Health	68.2	31.8	100
Occupational Health	83.1	16.9	100
Office (Physician or Dentist)	68.1	31.9	100
Other	85.6	14.4	100
All Fields	74.1	25.9	100

Source: Canadian Nurses' Association

(3) Mobility

There is some evidence that mobility is high in nursing compared with other professions considered in this report although no specific information is available on this subject.

Partial evidence in support of a high degree of mobility among nurses is provided by information on the annual rate of turnover within this profession. Turnover is measured as the number of nurses who leave their posts in one year as a percentage of the total employed in that year(1). In 1966, the mean turnover ratio of full-time general duty nurses in public hospitals was almost 60%, (Table 5.18). Of course some of the

(1) Because within a period of a year a position may be filled by more than one person, the rate of turnover does not have a limit of 100%. Nevertheless, it is a useful indicator of the volatile nature of the nursing stock.

nurses who leave posts at one hospital may take up other posts within the same hospital. What is clear, however, is that the rate of turnover increases as hospitals increase in size up to a certain point, 300-499 beds, and then declines slightly. Nurses in large hospitals appear to quit their posts twice as frequently as those in the smallest size institutions, 1-9 beds. This may be because the smaller hospitals are in small towns where alternative employment is less readily available.

TABLE 5.18

TURNOVER RATE OF FULL-TIME GENERAL DUTY NURSES IN CANADA, 1966
By Size of Public General Hospital

Percentages

Size of Hospital	Rate of Turnover of Nurses
1 - 9 beds	39.5
10 - 24 beds	54.6
25 - 49 beds	52.2
50 - 99 beds	59.3
100 - 199 beds	54.0
200 - 299 beds	58.4
300 - 499 beds	66.8
500 - 999 beds	60.6
1,000 - or more beds	60.4
Average	59.7

Source: Canadian Nurses' Association

(4) Geographical distribution

The geographical distribution of registered nurses, "employed in nursing" is very close to the provincial population distribution, (Table 5.19), much closer than is the case for other health professions. A comparison of these two series shows that six provinces - Ontario, the Western provinces and Prince Edward Island - have population-nurse ("employed in nursing") ratios that are below the national average. This ratio is lowest in Ontario and highest in Newfoundland. This ratio,

however, is only a partial measure of the availability of nursing services since it makes no allowance for full-time as opposed to part-time work, nor the services performed by nurses-in-training.

TABLE 5.19

REGISTERED EMPLOYED NURSES IN CANADA, 1968
By Province

Percentages

Province	Registered Nurses[a] Employed in Nursing	Population (1968)[b]
Newfoundland	1.0	2.4
Prince Edward Island	0.6	0.5
Nova Scotia	2.7	3.7
New Brunswick	2.9	3.0
Quebec	23.1	28.6
Ontario	41.2	35.2
Manitoba	5.1	4.7
Saskatchewan	4.7	4.6
Alberta	8.3	7.4
British Columbia	10.2	9.7
Yukon and N.W.T.	0.2	0.2
Total	100.0	100.0

(a) Canadian Nurses' Association. (b) Canadian Statistical Review

VIII. Lawyers

(1) Resources

At the 1961 Census, there were almost 13 thousand lawyers in Canada; one thousand judges and magistrates and 12 thousand "lawyers and notaries"[1]. Comparable figures were 9.6 and 8.4 thousand in 1951 and 1941

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(1) *In Canada there are two types of law professionals: barristers and sollicitors or "notaries" practising under the civil law system of Quebec. Quebec's notaries are similar in function to solicitors in*

respectively, yielding an average annual growth rate of 1.4% over the decade 1941-1951 and 3.0% between 1951 and 1961. In 1968, membership in the Canadian Bar Association, which is non-obligatory of practising lawyers stood at just over 16 thousand.

(i) <u>Age</u>

Canada's stock of law professionals has become younger during the post-war period. The median age range of male lawyers and notaries was 35-39 in 1961 as compared to 45-54 in 1941. But in the case of judges and magistrates where years of legal experience is an important criterion for selection, there is no parallel trend and the median age range of this group was 60-64 years in both 1941 and 1961.

(ii) <u>Sex</u>

The legal profession in Canada remains almost exclusively a male domain with women comprising only 2.5% of its membership in 1961. This is an increase, however, from the corresponding figure of 2.1% and 1.6% in 1951 and 1941 respectively.

(iii) <u>Origin</u>

The indigenous character of the Canadian Legal Systems precludes, for the most part, foreign-born or foreign-educated manpower from employment as lawyers in Canada. Nonetheless, the flow of immigrants intending to practice as lawyers in Canada has increased from 35 in 1962 to 65 in 1966, and 91 in 1968. At the 1961 Census, lawyers who had been born outside Canada accounted for 10% of the stock. Some of these however, may have received their legal training in Canada. The United Kingdom was the birthplace of about 50% of those born outside Canada.

(iv) <u>Education</u>

Lawyers are educated almost exclusively in the universities. Newfoundland and Prince Edward Island do not yet have university law faculties and lawyers may still qualify for entry to the profession in these two provinces on the basis of successful completion of examinations and a period of articleship of 4 years after university graduation in Newfoundland and 4 or 5 years in Prince Edward Island depending on whether or not the applicant held a university degree prior to the period of articleship. In the other eight provinces law graduates are required to

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(1) cont'd
the British legal system except that while the latter have a restricted right to plead court cases, notaries may not plead in court. Barristers specialize in the pleading of court cases and it is from this group that magistrates and judges are selected.

complete a period of articleship or professional training and write examinations prior to admission to practice. The professional training in law is the responsibility of the provincial law societies except in the case of professional training for 'notaries' in Quebec which is still conducted by civil law faculties. Formal education is provided in 15 university law faculties. Five of these institutions are in Ontario and four in Quebec; all other provinces excluding Newfoundland and Prince Edward Island have one university law faculty. The four Quebec institutions offer training in civil law and the eleven outside the province offer training in common law. Law faculties at the University of Ottawa and McGill University, since September 1968 offer both civil and common law programmes.

(2) Utilization[1]

In 1967 the Canadian Bar Association estimated that there were 15,248 lawyers and notaries in Canada. 56% of these were self-employed. In 1968-69, there were 277 lawyers engaged in teaching in law faculties, about 2% of all lawyers; judges and magistrates comprise a further 6-8% of Canada's law professionals. The remainder, slightly in excess of one-third of the total supply, practice law as salaried employees with industry and public authorities.

(3) Geographical distribution

The geographical distribution of Canada's law professionals is relatively close to that of the population but even closer to that of the population in urban centres, reflecting the fact that a considerable part of the demand for legal services comes from the industrial and business community and the public sector which are largely concentrated in these

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(1) No single source provides data on the distribution of law professionals by employment status, work function or type of employer. However, by incorporating data from different sources we may derive rough estimates of partial aspects of these characteristics.

The distinction between barristers and solicitors while still pertinent in terms of job function is no longer relevant from the viewpoint of occupational classification, since both receive identical formal and professional training.

TABLE 5.20

LAW PROFESSIONALS IN CANADA, 1941 AND 1961
By Province

Province	1941		1961	
	Judges and Magistrates	Lawyers and Notaries	Judges and Magistrates	Lawyers and Notaries
Newfoundland	--	--	24	74
Prince Edward Island	7	51	7	41
Nova Scotia	38	244	31	293
New Brunswick	35	199	31	213
Quebec	85	2,587	181	3,322
Ontario	163	2,817	282	4,902
Manitoba	32	524	38	616
Saskatchewan	41	418	51	408
Alberta	38	476	87	951
British Columbia	38	604	99	1,248
Yukon	--	--	1	8
Northwest Territories	--	--	2	12
CANADA	478	7,920	834	12,088

Source: Census of Canada, 1941, 1961.

urban centres. In 1961, about two-thirds of all law professionals were practising in Ontario and Quebec and this proportion has been quite steady since 1941 with slight declines in Quebec's share being offset by increases in Ontario's share of total law professionals, (Table 5.20). Of the remaining provinces, British Columbia and Alberta which ranked third and fourth respectively in 1961 to Ontario and Quebec, have increased their share since 1941; the increase was especially pronounced in Alberta where the proportion increased from 6.2% to 8.0% between 1951 and 1961. The remaining six provinces all experienced declines in their respective shares over the period.

IX. Teachers

1. Resources

There were about 295 thousand teachers in all levels of the education system in Canada in 1967-68, (Table 5.21). To these can be added at least 2 thousand non-teaching professional personnel who are employed in teaching establishments and whose numbers are growing rapidly.

TABLE 5.21

TEACHERS[(a)] IN CANADA, 1967-68
By Level in Education System and by Sector

Thousands

Level in System	Public Sector[(b)]	Private Sector
Elementary	149	5
Secondary	85	9
Vocational	27	1
Teacher Training[(c)]	4	0
University	14	0
Total	279	15

Source: Education Division, Dominion Bureau of Statistics.

Notes: (a) Full-time teachers and principals only in public elementary and secondary schools.
(b) Includes federal schools for blind and deaf.
(c) Includes Faculties of Education in degree granting institutions which are not included in university. Also includes part-time teachers.

The large and growing education sector draws heavily on the country's resources of highly qualified manpower in terms of its demand for teaching personnel. Education consumes part of its own product in that school teachers go to college or university; most become graduates and then many go into teaching in the elementary and secondary school systems. Other graduates stay on in university to take higher degrees and to do research and many are absorbed into the teaching stock at that level.

In addition, a modern education system requires other professionals in non-teaching occupations such as child psychologists, administrators, laboratory personnel and so on. The total teaching force has grown very rapidly during the 1950's and 1960's. In the primary and secondary schools and in the universities and colleges the ratio between staff and pupils has at least been maintained at a constant level, and in recent years the ratio has improved, (Table 5.22).

This means that the size of the teaching stock has kept pace with the enormous rise in student enrolments at all levels of the education system. Between 1956 and 1966 enrolments in public primary schools rose from 2.7 million to 3.7 million, and between the same years in public secondary schools from 480 thousand to 1.2 million. In universities, enrolments rose from 73 thousand in 1955 to 206 thousand in 1965. At the same time, the total teaching force at all levels of education in Canada has trebled in size since 1950. This force is now the largest single component of Canada's highly qualified manpower resources.

Two-thirds of the teaching stock are employed in primary and secondary schools. Although the number in vocational schools is small in relation to the total, this is a rapidly expanding sector as is the university sector.

(i) Age-Structure

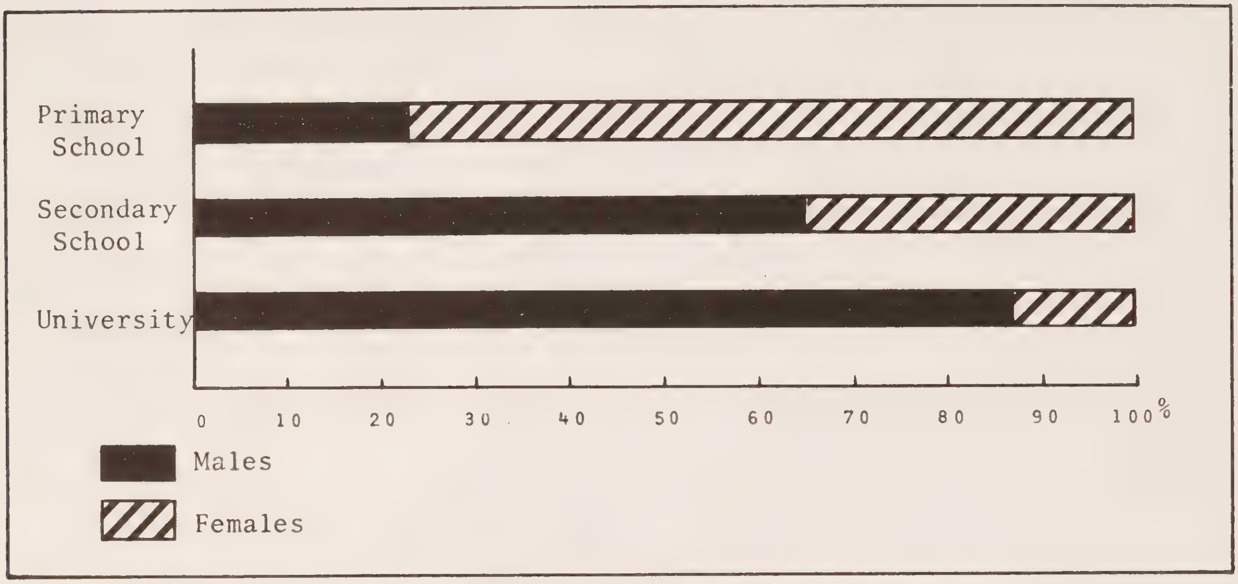
Teaching employs many more young professionals than any other occupation considered in this report. In 1967-68, over one-third of the teachers in primary schools were below age 35, and the same was true of over one-quarter of secondary school teachers, (Table 5.23). In universities, the median age of all teachers was 38 years in 1967-68 while only 2% were below age 25.

(ii) Sex

Over two-thirds of all primary school teachers were women in 1967-68, (Figure 5.13) and of these, 58% were married. In secondary schools, the ratio of women to men teachers was reversed; men outnumbered women by

FIGURE 5.13

TEACHERS IN PRIMARY AND SECONDARY SCHOOLS AND UNIVERSITIES IN CANADA, 1967/68[a]
By Sex



(a) Excluding Quebec for teachers in Elementary and Secondary schools.

Source: Salaries and Qualifications of Teachers in Universities and Colleges. D.B.S. Cat. No. 81-203, 81-202.

TABLE 5.22

TEACHER - PUPIL RATIOS IN CANADA, 1956-1965
By Sector of Education

Year	Sector of Education		
	Primary[a]	Secondary[a]	University[b]
1956-57	1: 28.1	1: 19.8	..
1957-58	1: 29.1	1: 19.5	..
1958-59	1: 27.8	1: 20.4	..
1959-60	1: 28.1	1: 20.1	..
1960-61	1: 27.8	1: 20.7	1: 14.4
1961-62	1: 27.4	1: 20.6	1: 14.4
1962-63	1: 27.1	1: 19.8	1: 14.5
1963-64	1: 27.3	1: 19.4	1: 14.5
1964-65	1: 27.0	1: 18.4	1: 14.5
1965-66	1: 26.4	1: 17.6	1: 14.5

.. = Not available.

Source: (a) "Projection of enrolment and teacher demand in Canada to 1977-78," Canadian Teachers Federation (1967).

(b) Salaries & Qualifications of Teachers in Universities and Colleges, D.B.S. Cat. No. 81-203.

TABLE 5.23

TEACHERS IN PRIMARY AND SECONDARY SCHOOLS[a], AND UNIVERSITIES IN CANADA, 1967-68
By Age

Percentages

Age Group	Primary School Teachers (b)	Secondary School Teachers (b)	University Teachers
Below 25	35.0	29.0	2.0
25 - 34	41.0	44.0	36.0
35 - 44	15.0	18.0	34.0
45 - 54	7.0	7.0	18.0
55 - 64	3.0	3.0	7.0
65 - 69	..	..	1.0
Over 70	..	..	..
Total	100.0	100.0	100.0

.. = Not available.

(a) Excludes teachers in vocational and private schools.
(b) Excludes Quebec.
(c) Totals may not add to 100 because of rounding.

Source: Primary and secondary school teachers: calculated from data on years of experience, D.B.S., Cat. No. 81-202.
Salaries and Qualifications of Teachers in Universities and Colleges. D.B.S. Cat. No. 81-203.

two to one. In Universities male teachers greatly outnumbered female teachers and accounted for 87% of the total staff.

(iii) Origin

Of all teachers in primary and secondary schools in Canada, only 7% received their original teaching certificate outside Canada. The main countries of origin for which separate information is given are the United Kingdom, accounting for 3% of certified teachers, and the United States, 1%. The contribution from abroad relative to the size of the stock of elementary and secondary school teachers is therefore small; however, although the proportion is small, the actual numbers are still large - compared to those entering other highly qualified occupations from abroad. In 1967, over 5 thousand persons entered Canada with the stated intention of entering school-teaching.

The staff at Canadian universities consists of a larger proportion of foreign-born than is the case in elementary and secondary schools. Almost 25% of "Professors and College Principals" were born outside Canada(1), 7% in the United Kingdom, 5% in the United States.

(iv) Education

In 1967-68, the majority of elementary school teachers in Canada did not possess a university degree, (Table 5.24). Only 15% of elementary school teachers possessed a university degree compared with 72% of secondary school teachers.

The formal educational level of post-secondary teachers is between that of elementary and secondary school teachers. 52% did not possess a university degree, however, many of these teachers are probably skilled craftsmen, technicians or persons qualified through their experience in particular occupations.

University teachers have the highest formal level of qualifications in the teaching profession. There has been a steady increase in their academic attainment - measured in terms of those holding doctoral degrees. In 1957, slightly over 40% of Canadian University teachers had a doctorate degree. By 1967-68 this percentage had risen to 47%. At the master's level, the position remained roughly constant over the

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(1) *Census of Canada, 1961; this is the only comprehensive source of evidence on the foreign-born component of university staffs.*

TABLE 5.24

TEACHERS IN CANADA, 1967-68
By Sector of Education and by Level of Qualification

Percentages

Sector of Education	Level of Qualification				Total (c)
	Less than degree level	Bachelor's Degree	Master's Degree	Doctorate	
Elementary	84.6	14.1	1.3	-	100.0
Secondary	27.2	65.4	7.2	0.2	100.0
Post-Secondary	52.0	33.0	15.0 [a]	-	100.0
University	2.0 [b]	17.0	32.0	47.0	100.0

- = Less than 0.1%.

(a) All teachers including those who with degrees must have certified status in all provinces.
(b) Includes some with Doctorates.
(c) Includes those who did not respond.

Source: Salaries and Qualifications of Elementary, Secondary, Vocational and University teachers. D.B.S.

same ten-year period. It was more common for the younger faculty members to have degrees beyond the bachelor level in 1967-68 than it was in 1957-58.

(2) Utilization

A treatment of the question of utilization of teachers in Canada can only be very general. While there is some information about the deployment of teachers both between and within particular sectors of the educational system, little is known about the tasks that teachers perform, or how effectively their skills are used in the performance of these tasks. There exists, however, information showing the extent to which teachers with different levels of qualifications are employed within the provinces.

(i) The Utilization of Total Resources

In the previous section we examined the employed manpower resources of Canada's educational system. There are probably a large number of people qualified to teach, however, who are not included in the employed labour force. Many of these will be trained female teachers (or female graduates without a teaching certificate but with the ability to acquire one) who have left teaching. We have no information about the size or character of these unused resources and there is no way of estimating the extent to which qualified teachers - no matter which definition of "qualified" we use - take up their occupation.

We can gain some idea of the potential size of these unused resources however, from an examination of the outflow from the teaching stock in any one year. During 1967-68, for example, about 10% of the total teaching stock resigned and moved out of teaching; a small proportion moved into administrative positions within the educational system; roughly equal proportions moved into "housekeeping"[1] and non-teaching activities, whereas a large proportion went to take courses of further academic or professional training. These proportions translate into a wastage from the Canadian teaching stock (excluding Quebec) of about 15 thousand teachers in 1967-68. If in only one year roughly 15 thousand teachers left their posts to take up non-teaching activities, then the potential size of the pool of unused manpower resources is very large. It is important to know the size of this pool if one is to make a firm estimate of the utilization of available manpower resources in the education system.

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(1) *Salaries and Qualifications of Teachers in Elementary and Secondary Schools. D.B.S. Cat. No. 81-202.*

(ii) Employment

The pattern of employment obtained from any group within highly qualified manpower is an important determinant of its utilization. Self-employed professionals, for example, can exert much more control over the type of function they perform and their workload than those in employment. Teachers fall almost entirely into the employed category and almost all of these are employed in institutions which are in receipt of some public financial support[1]. Some schools in Canada, however, are supported from private funds. The private elementary and secondary sector employs just over 14 thousand teachers and the vocational sector 1 thousand.

A complete discussion of utilization in the teaching profession would take account of the difference in responsibilities of staff and their teaching loads. It is not possible, however, on the basis of published information to differentiate between teachers in respect of their activities within the school. We have no information on the extra-curricular activities performed by different teachers, nor even of curricular activities - the subjects taught by teachers. At the university level, however, there is more information on staff activities. Over the decade 1957-67 Deans and Heads of Departments in Canadian universities have had to take on responsibility for larger faculties and departments and their numbers have increased in absolute terms.

3. Mobility[2]

The previous section described the large outflow of teachers from the teaching stock that takes place in any one year. Some of the outgoing teachers are moving to teaching positions either outside the province or within the province. In 1967-68 about 3% of the teaching stock in each province moved out to teach in another province. There seems to be a distinct pattern to this inter-provincial mobility. The net flow of teachers into provinces, (in-migration minus out-migration) has generally been into Ontario, Alberta and British Columbia at the expense of the Maritimes, Manitoba and Saskatchewan. One result is that a

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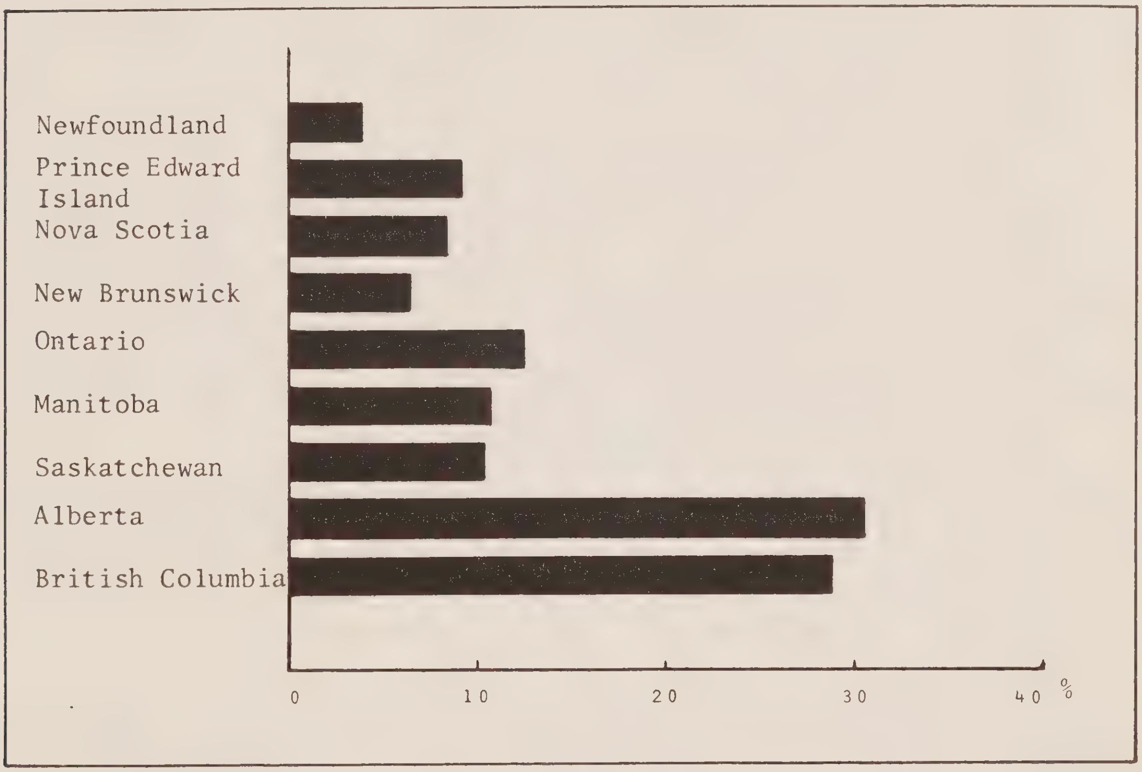
(1) *Under this definition we include all Canadian Universities in the "public sector".*

(2) *This section relies largely on the unpublished doctoral research of Mr. J.D. Muir of the University of Alberta which was based on D.B.S. sources, (Cat. No. 81-202).*

large proportion of the teachers in any particular province hold certification from another province, (Figure 5.14). Thus one-third of teachers in Alberta, for example, received their original certification from another province.

FIGURE 5.14

TEACHERS IN CANADA, 1967/68
By Province, Holding Original Certification From Another Province



Source: Salaries and Qualifications of Teachers in Elementary and Secondary Schools, 1967/68. D.B.S. Cat. No. 81-202.

As far as mobility within provinces is concerned, some evidence suggests that those teachers who move within provinces generally move from rural to urban areas.

X. Earnings

Information on the earnings of manpower employed in highly qualified occupations other than those covered by the 1967 Survey of Scientists and Engineers, is very limited. For example, whereas in Chapter 4 variables such as age, sex, experience, education and work function are cross-classified with earnings of scientists and engineers, this section is mainly restricted to earnings data taken from official taxation statistics which cannot be directly related to the characteristics of the members of the different occupations. Nonetheless some structuring of earnings data is possible and an attempt is made to follow the approach taken in the corresponding section of Chapter 4.

1. Earnings by Employment Status

In most occupational groups the earnings of those who are self-employed are higher than those who are in the employ of others. This is true for scientists and engineers. It is also true for the other highly qualified occupations considered in this chapter. In this group, of those who were self-employed in 1967, physicians had the highest average income per annum at $27,347; engineers and architects ranked second with $22,111; lawyers were third with $22,014; dentists were fourth with $17,488 and accountants fifth at $14,517.(1)

Over the eleven-year period 1957 to 1967 the differential between these groups has shifted slightly with the result that physicians appeared to earn relatively more than the other professionals in 1967 than they did in 1957, (Table 5.25).

2. Lawyers

Earnings data for salaried lawyers is scant. The Dominion Bureau of Statistics(2) reports mean salaries of law professors in 1967-68 at $13,189 as compared to $8,110 in 1957-58, yielding an average annual

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(1) Data was obtained from the Department of National Revenue Taxation Statistics. We define income to be that derived post-tax from wages and salaries, commissions from employment, commissions from self-employment, business income and professional income. Investment income is excluded.

(2) Salaries and Qualifications of Teachers in Universities and Colleges - 1967-68 and 1957-58; D.B.S. Cat. No. 81-203.

growth rate of 5.0%. The income of self-employed lawyers increased by 6.4% annually between 1958 and 1967. Thus the earnings differential between self-employed lawyers and law professors has increased over the last decade.

Since university salaries are generally lower than those paid in private industry and government, mean salaries of law employees in the latter sectors are probably higher than those paid law professors but less than the average income of self-employed law professionals.

3. Dentists

The average income of self-employed dentists was $18,273 in 1967. This represents a 6.2% increase from 1966. Between 1959 and 1967 the income of self-employed dentists increased by 57.5% which was higher than the rate for most other self-employed professionals with the exception of physicians, (Table 5.26).

There is a marked variation in the average incomes of self-employed dentists between the provinces, (Table 5.27). Incomes are generally higher in Newfoundland, Ontario and the Western provinces, and lower in Quebec and the Maritimes. These differences may be due either to differences in the nature of the services performed, the fee charged for services, or the volume of services performed. If we assume a homogeneous mix of dental services between provinces, then interprovincial differences in dentists' incomes must be due to the two latter factors(1). Fees charged for service are generally based on the fee schedules of provincial dental associations which reflect per capita income in the respective province. The average volume of services performed per dentist varies between provinces in a manner approximating to inter-provincial dentist-population ratios. A possible conclusion might be that while the volume of service is higher in Quebec and the Maritimes than in Ontario and the Western provinces, it is not high enough to compensate for the lower fee per service in the former provinces. Dentists in Newfoundland registered the highest earnings in all Canada despite the lowest provincial fee schedules by performing a significantly larger volume of services.

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(1) *While the unequal geographical distribution of specialists will admittedly cause variations in the mix of dental services between the provinces specialists perform a relatively small portion of the total volume of dental service and can therefore be excluded without affecting the analysis.*

TABLE 5.25

AVERAGE NET INCOME (FROM ALL SOURCES) OF TAXABLE PROFESSIONALS, SELECTED YEARS

Class	1957	1959	1961	1963	1965	1967
	$	$	$	$	$	$
Physicians and surgeons	13,996	15,737	17,006	19,433	23,229	27,347
Engineers and architects	14,581	14,982	14,692	14,989	19,279	22,111
Lawyers and notaries	13,244	14,123	15,718	16,283	19,192	22,014
Dentists[a]	10,234	11,605	12,337	13,679	15,693	18,273
Accountants	10,879	11,033	11,627	10,994	13,448	14,517

(a) Dentists income is not adjusted in precisely the same way as that of other professionals in this table and is therefore not exactly comparable.

Source: Taxation Statistics, Department of National Revenue.

TABLE 5.26

MEAN INCOME OF SELF-EMPLOYED DENTISTS, 1959-1967

Year	Income[a]
1959	11,605
1960	12,238
1961	12,337
1962	13,707
1963	13,679
1964	14,909
1965	15,693
1966	17,212
1967	18,273

(a) Includes wages and salaries, commissions from employment, commissions from self-employment, business income and professional income.

Source: Department of National Revenue, "Taxation Statistics".

TABLE 5.27

INDEX OF AVERAGE INCOME OF SELF-EMPLOYED DENTISTS, 1965
By Province

Province	1965
Newfoundland	121
Prince Edward Island	77
Nova Scotia	83
New Brunswick	82
Quebec	76
Ontario	111
Manitoba	99
Saskatchewan	106
Alberta	112
British Columbia	105
CANADA	100

Source: Based on data from Department of National Health and Welfare, "Earnings of Dentists in Canada, 1959-1965.

4. Optometrists

In 1966, the median annual income of optometrists in Canada was $13,916, (Table 5.28). About 4.3% of the responding optometrists reported incomes in excess of $30,000. Median income ranged from a low of $12,249 in Newfoundland to a high of $16,999 in Saskatchewan and was significantly higher in the western provinces than in the rest of Canada, excluding New Brunswick.

Only one-third of interprovincial differences in income may be explained by differences in work-load of practitioners between the provinces. The remainder must be due to differences in the fee charged per service or in the nature of the services performed. Since there is a marked homogeneity in the distribution of the work-load by type of service between provinces, one may conclude that the higher incomes of the optometrists in the Western provinces is partly due to a higher scale of fees for optometric services in these provinces.

TABLE 5.28

NET MEDIAN INCOME[a] OF OPTOMETRISTS IN CANADA, 1966
By Province

Province	Median Income
Newfoundland	$ 12,249
Prince Edward Island	..
Nova Scotia	12,999
New Brunswick	15,000
Quebec	12,544
Ontario	12,877
Manitoba	15,856
Saskatchewan	16,999
Alberta	16,500
British Columbia	15,399
Canada	13,916

.. = Not available.

(a) Income (after taxes) from practice of optometry.

Source: Report of a Fees and Economic Survey of Canadian Optometry, Canadian Association of Optometrists.

(5) Physicians

Physicians' earnings reported in this study are those of doctors whose main source of income is in the form of fee payment for personal medical services. Excluded are incomes of physicians whose gross earnings are derived mainly either from salaried professional services or from non-medical sources.

In 1966[(1)], the average gross professional earnings of 17,040 Canadian physicians engaged in private fee practice was $35,223, (Table 5.29). This represented a rise of 7.4% over 1965, and compared to an average annual rate of increase of 6.0% from 1957 to 1966. Average expenses increased more sharply in 1966 to $11,961 from $10,735 in the previous year, or by 11.4%. Accordingly, the average net income from professional practice increased at a slower rate than both gross earnings and expenses. The rate of increase in 1966 was 5.4% to $23,262 from the 1965 average of $22,064. This fell below the average rate of growth of 6.8% from 1957 to 1966.

TABLE 5.29

PROFESSIONAL EARNINGS AND EXPENSES OF ACTIVE FEE PRACTICE PHYSICIANS - CANADA, 1957, 1965 AND 1966

Year	Number of Physicians	Average Gross Earnings	Average Expenses	Average Expenses as a Percentage of Average Gross	Average Net Earnings	Annual Per Cent Increase Over Previous Year	
						Average Gross Earnings	Average Gross Earnings
1957	12,957	$20,804	$ 7,952	38.2	$12,852	--	--
1965	16,460	$32,799	$10,735	32.7	$22,064	7.2	7.7
1966	17,040	$35,223	$11,961	34.0	$23,262	7.4	5.4

-- = Not available

Source: "Earnings of Physicians", Department of National Health and Welfare, 1967.

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(1) The latest year for which full earnings information is available.

Changes in provincial fee schedules in 1966 affected physicians' earnings in several provinces. New schedules were introduced in Prince Edward Island, New Brunswick and Alberta. Amendments or minor revisions of existing schedules were implemented in Ontario and British Columbia.

"Rates of payment to physicians under doctor sponsored medical insurance plans showed few changes relative to the schedule in force. Payments under the Maritime Medical Care Program were increased to 90% of the applicable fee schedule from 85% the previous year. Fee payments for general practitioners' office visits were increased by an average of 40% by the Manitoba Medical Service in lieu of an increase in the pro-rating percentage.

The introduction of the British Columbia Medical Plan in September 1965 and the Ontario Medical Insurance Plan in July 1966 may be cited as important factors in increases in physicians' earnings in 1966.

(i) Physicians' Earnings by Age Group

During 1966, as in 1965, physicians in the age group 45 to 54 received both the highest average gross and net professional incomes. These were $41,817 and $27,738. Expenses of practice, $14,079, were also highest in this group.

Among the factors to be taken into account (but not given here) in examining levels of earnings and expenses for physicians in different age groups are the concentration of specialists, the state of activity of physicians and the extent of their initial investment. Patterns by age groups were virtually identical to 1965. Both earnings and expenses increased in proceeding to older age groups until the age range 45 to 54 and thereafter declined. As in 1965, the highest ratio of expenses to gross income occurred in the group 65 and over. This ratio gradually increased with advancing age groups with the exception that for the age range under 35 it exceeded the subsequent group. Average income from other sources increased consistently with advancing age groups."[1]

6. Pharmacists

Current data on the income of pharmacists are available for only proprietors or managers of retail pharmacies. The Canadian Pharmaceutical Association's survey of retail pharmacies disclosed that average (mean) salaries of these pharmacists was $12,665 in 1967, (Table 5.30).

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(1) "Earnings of Physicians in Canada, 1966," Department of National Health and Welfare, 1968.

TABLE 5.30

AVERAGE SALARIES OF PROPRIETORS OR MANAGERS IN RETAIL PHARMACY, 1967
By Province

Province	Salary
Newfoundland	$11,988
Prince Edward Island	8,889
Nova Scotia	12,790
New Brunswick	10,130
Quebec	11,258
Ontario	13,014
Manitoba	11,008
Saskatchewan	11,212
Alberta	10,726
British Columbia	12,971
CANADA	12,665

Source: Canadian Pharmaceutical Association, 26th Annual Survey of Retail Pharmacy

Incomes were highest in Ontario, ($13,014); and in only two other provinces - British Columbia and Nova Scotia - did they exceed the national average. Among the other provinces, proprietors or managers of retail pharmacies in Newfoundland received the next highest incomes. Incomes were lowest in Prince Edward Island. Provincial income differentials in other fields of pharmacy may parallel those of proprietors or managers of retail pharmacies.

There is considerably more marked variation in incomes of pharmacists between fields of pharmacy. In 1962, the average of salaries for pharmacists in manufacturing was $9,551 - almost twice that for hospital pharmacy practice. Earnings were next highest for pharmacists employed at universities. Mean incomes for pharmacists in retail pharmacy in that year was $6,794 - only 53.7% of the 1967 income reported above. The actual increase in income of retail pharmacists is probably smaller than what these figures suggest, since the 1962 average is for all retail pharmacists (i.e. including employees working for salaries) while the 1967 income data are for proprietors or managers, a more highly-paid group.

TABLE 5.31

AVERAGE INCOMES OF PHARMACISTS, 1962
By Field of Pharmacy

Field of Pharmacy	Average Income
Retail	$6,794
Manufacturing	$9,551
Hospital	$5,048
Government	$7,323
University	$8,285

Source: Ross, op. cit., page 74

(7) Nurses

The discussion of salaries is restricted to salaries paid to nurses in public general hospitals which employ over 70% of all professional nurses in the labour force.

Median salaries of nurses are highest in the North West Territories, (Table 5.32). Among the other provinces, Ontario, British Columbia and Quebec pay the highest salaries. Nurses in the Prairie provinces were next best paid, then the Maritime provinces. Nurses' salaries were lowest in Newfoundland.

Besides geographic differentials, salaries in nursing vary accordingly to the level of education and type of position held, (Table 5.33). Level of education is relatively unimportant in explaining salary differentials in the lower nursing positions but becomes of considerable importance at the top of the nursing hierarchy. For example, while a full-time general duty nurse with her R.N. and master's degree is paid but 5% more than her colleague with an R.N. only, the Nursing Director with an R.N. and master's degree receives almost 50% more than one with an R.N. only. Moreover, upward mobility in the job hierarchy is probably becoming increasingly influenced by academic qualifications.

TABLE 5.32

MEDIAN ANNUAL SALARIES OF FULL-TIME GENERAL DUTY NURSES EMPLOYED IN PUBLIC GENERAL HOSPITALS WITH R.N. ONLY IN CANADA, 1967
By Province

Geographic Region	Median Salary
Newfoundland	$3,720
Prince Edward Island	3,912
Nova Scotia	4,680
New Brunswick	4,476
Quebec	4,888
Ontario	4,992
Manitoba	4,740
Saskatchewan	4,596
Alberta	4,740
British Columbia	4,908
Yukon	--
North West Territories	5,220
CANADA	4,920

-- = Not available

Source: Canadian Nurses' Association

TABLE 5.33

MEDIAN ANNUAL SALARIES OF FULL-TIME NURSES EMPLOYED IN PUBLIC GENERAL HOSPITALS, 1967
By Type of Position and Highest Education Qualification

Highest Education Qualification	Type of Position			
	Full-Time General Duty Nurse	Full-Time Head Nurse	Full-Time Supervisor	Full-Time Director
R. N. only	$4,920	$6,110	$6,436	$6,600
R.N. and University Diploma	5,712	6,504	6,720	7,500
R.N. and Baccalaureate	5,304	6,600	7,212	8,700
R.N. and Master's	5,184	6,660	7,536	9,792

Source: Canadian Nurses' Association

8. Teachers

The median salary for all teachers in public elementary and secondary schools in 1967-68 for all provinces, excluding Quebec, was $6,524. This represents an increase over the median of the previous year of 17.2% - the highest yearly increase since comparable data was recorded. The median salary of secondary school teachers was $2,492 higher than that of elementary school teachers, a difference of 42%. Inter-provincial differences between salaries at both levels are high but it is very difficult to analyse to what extent they are due to factors other than teaching experience and qualifications on which salaries are based.(1)

Salaries vary to some extent with the type and size of community in which the school is located. In 1967-68 for example, secondary school teachers in Saskatchewan who taught in schools in communities of over 100 thousand people received salaries 25% higher than teachers in communities of between 1 thousand and 10 thousand people, and 28% higher than teachers in one-room rural schools. This probably reflects the fact that schools in urban areas are able to recruit teachers with higher qualifications than schools in rural areas.

The median salary for full-time university teachers, (lay teachers) in 1967-68 was $11,403. There was a wide range, however, between the different levels of staff. Deans earned a median salary of $20,979 while lecturers earned $7,990. Also, male university teachers earned $11,777 which was $2,495 more than that earned by female teachers.

The median salary of university teachers varied with the size of the institution but not very widely. For staff teaching at institutions with over 5 thousand students, the median salary was $12,018; for those teaching at small establishments of less than 500 students, the median was $11,208.

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(1) *Salaries and Qualifications of Teachers in Elementary and Secondary Schools, 1967-68, D.B.S. Cat. No. 81-202.*

APPENDIX I

FLOWS OF HIGHLY QUALIFIED MANPOWER

APPENDIX TABLE I.1

GRADUATIONS FROM CANADIAN UNIVERSITIES, PROFESSIONAL IMMIGRATION, AND PROFESSIONAL EMIGRATION TO THE UNITED STATES, 1954-67

Year	Total Graduations (a)	Professional Immigration (b)	Professional Emigration to the U. S. (c)
1954	13,793	8,350	3,352
1955	14,599	7,159	4,166
1956	15,495	9,343	5,277
1957	16,575	16,040	6,251
1958	17,846	7,553	4,784
1959	19,074	6,947	5,593
1960	21,095	7,436	5,587
1961	22,992	6,696	5,285
1962	26,236	8,218	5,833
1963	28,794	9,640	6,344
1964	33,055	11,965	6,171
1965	38,162	16,654	6,453
1966	44,400	23,637	4,926
1967	50,884	30,853	6,386

Sources:

(a) Survey of Higher Education, D.B.S., Cat. No. 81-204.

(b) "Immigration Statistics", 1954-65, Department of Citizenship and Immigration; 1966-67, Department of Manpower and Immigration.

(c) Emigration data compiled from the annual statistics of the United States Department of Justice, Immigration and Naturalization Service.

APPENDIX TABLE I.2

FULL-TIME ENROLMENT IN UNDERGRADUATE DEGREE COURSES
By Field of Study

Field of Study	1956-1957	1966-1967	Increase 1957 to 1967 as % of 1957 Enrolments
Pure Science	5,151	28,568	455
Education	4,387	23,938	446
Arts	26,341	94,142	257
Nursing	1,322	3,568	170
Architecture	580	1,174	102
Optometry	87	164	88
Law	2,651	4,464	68
Dentistry	882	1,335	51
Pharmacy	1,145	1,672	46
Engineering	13,050	18,498	42
Medicine	4,494	4,795	7
Other	12,539	30,635	144
Total Reported	72,629	212,953	193

Source: Fall Enrolments in Universities and Colleges, D.B.S., Cat. No. 81-204, Table 1.

APPENDIX TABLE I.3

BACHELOR AND FIRST PROFESSIONAL DEGREES GRANTED
By Field of Study

Field of Study	1956-1957	1966-1967	Increase 1957 to 1967 as % of 1957 Graduations
Education	1,193	6,496	445
Pure Science	887	4,308	386
Nursing	174	810	366
Arts	5,782	21,452	271
Dentistry	177	310	75
Optometry	26	41	58
Law	663	1,041	57
Architecture	90	132	47
Engineering	1,741	2,420	39
Pharmacy	282	331	17
Medicine	875	940	7
Other	2.878	5,562	93
Total Graduations	14,768	43,843	197

Source: Preliminary Statistics on Education, D.B.S. Cat. No. 81-201.

APPENDIX TABLE I.4

MASTER'S DEGREES GRANTED, 1957 AND 1967
By Field of Study

Field of Study	1957	1967	Increase as % of 1957
Engineering	99	498	403
Physical Science	178	597	235
Biological Science	198	588	197
Social Science	663	3,080	365
Humanities	321	1,419	342
Total	1,459	6,182	324

Source: Survey of Higher Education, Part II, D.B.S. Cat. No. 81-211.

DOCTORATE DEGREES GRANTED, 1957 AND 1967
By Field of Study

Field of Study	1957	1967	Increase as % of 1957
Engineering	12	101	742
Physical Science	116	299	158
Biological Science	86	166	93
Social Science	33	109	230
Humanities	41	112	173
Total	288	787	173

Source: Survey of Higher Education, Part II, D.B.S. Cat. No. 81-211.

APPENDIX TABLE I.5

MASTER'S AND DOCTORATE DEGREES GRANTED, 1957 AND 1967
By Field of Study

Field of Study	Master's		Doctorate	
	1957	1967	1957	1967
Engineering	7	8	4	13
Physical Science	12	10	40	38
Biological Science	14	9	30	21
Social Science	45	50	12	14
Humanities	22	23	14	14
Total	100	100	100	100

Source: Survey of Higher Education, Part II, D.B.S. Cat. No. 81-211.

APPENDIX

STUDENT NURSES IN
By Type of School

Year	Hospital Schools			
	Diploma		Diploma/Certificate	
	Enrolment	Graduation	Enrolment	Graduation
1963	23,271	6,764	953	807
1964	23,405	7,107	959	708
1965	23,777	7,154	883	840
1966	23,931	7,167	744	675
1967	24,323	7,249	440	644
1968	25,100	..	..	460

.. = not available

Source: Canadian Nurses' Association.

TABLE I.6

CANADA, 1963-68
And Program

University Schools					
Baccalaureate				Master's	
Basic		Post-Basic			
Enrolment	Graduation	Enrolment	Graduation	Enrolment	Graduation
1,291	171	526	216	20	9
1,410	154	724	255	22	8
1,595	206	804	343	29	10
1,766	220	1,052	442	44	4
1,956	273	1,367	538	54	15
2,161	..	..	667	..	16

APPENDIX TABLE I.7

STUDENTS ENROLLED FOR MASTER'S OR DOCTORATE IN SCIENCE AND ENGINEERING, 1968
By Citizenship

Citizenship	No.	%
North and Central America	735	6.5
Asia	2,181	19.5
Europe	1,146	10.3
Africa	210	1.9
Other Foreign Countries	656	5.9
Total Non-Canadian	4,928	44.1
Total Canadian	6,245	55.9
Total	11,173	100.0

Source: Projections of Manpower Resources and Research Funds 1968-1972. A Report of the Forecasting Committee of the National Research Council of Canada, 1969 - pages 53, 54.

APPENDIX TABLE I.8

CANADIANS STUDYING AT INSTITUTIONS OF HIGHER LEARNING IN THE UNITED STATES
By Field of Study

Percentages

Field of Study	1957-58	1967-68
Engineering	18	9
Humanities	26	25
Health Fields	11	6
Physical and Natural Science	15	13
Social Science	7	13
Other	23	34
Total	100	100
Absolute Numbers	5,271	12,144

Source: "Open Doors", annual publication of the Institute of International Education, New York, Table 11.

APPENDIX TABLE I.9

ENGINEERS
IMMIGRATION, EMIGRATION TO THE UNITED STATES
AND FIRST DEGREE GRADUATIONS, 1954-67

Year	Immigration (a)	Emigration to the United States (b)	First Degree Graduations (c)
1954	1,700	500	1,250
1955	1,300	600	1,350
1956	1,700	950	1,600
1957	3,100	1,250	1,750
1958	1,000	720	1,950
1959	800	1,300	2,050
1960	700	880	2,180
1961	555	820	2,410
1962	970	880	2,430
1963	1,200	830	2,250
1964	1,480	820	2,420
1965	2,250	910	2,260
1966	3,200	1,000	2,245
1967	3,700	1,300	2,420

Sources:

(a) "Immigration Statistics", 1954-65, Department of Citizenship and Immigration; 1966-67, Department of Manpower and Immigration.

(b) Emigration data compiled from the annual statistics of the United States Department of Justice, Immigration and Naturalization Service.

(c) Survey of Higher Education, D.B.S. Cat. No. 81-204.

APPENDIX TABLE I.10

SCIENTISTS AND ENGINEERS ADMITTED TO THE UNITED STATES AS IMMIGRANTS, 1962-1967

	Year	Canadian-Born	Total Immigrants from Canada	Canadian-Born as % of Total
Engineers	1962	372	823	45.2
	1963	429	897	47.8
	1964	459	796	57.7
	1965	512	902	56.8
	1966	430	858	50.1
	1967	540	1,209	44.7
Natural Scientists	1962	131	237	55.3
	1963	172	274	62.8
	1964	186	293	63.5
	1965	202	298	67.8
	1966	139	253	54.9
	1967	161	352	45.7
Social Scientists	1962	23	35	65.7
	1963	32	50	64.0
	1964	40	55	72.7
	1965	47	66	71.2
	1966	48	62	77.4
	1967	37	62	59.7

Source: National Science Foundation publications, "Scientists and Engineers Abroad 1962-64", and "Scientists, Engineers and Physicians from Abroad". Surveys of Science Resource Series.

APPENDIX II

SELECTED TABLES
FROM THE 1967 SURVEY
OF SCIENTISTS AND
ENGINEERS

THE NUMBERS OF SCIENTISTS AND
ENGINEERS GIVEN IN THE FOLLOWING
TABLES ARE ESTIMATES OF THE TOTAL
SURVEY POPULATION

SCIENTISTS AND ENGINEERS
By Field of Principal Employment

Field of Principal Employment	20 - 24	25 - 29	30 - 34
Architecture	49	167	430
Engineering - Total	866	4,688	5,038
Aeronautical	*	79	73
Ceramic	-	*	11
Chemical	54	222	299
Civil	97	752	1,088
Electrical - Total	199	1,027	875
Electronics	141	683	590
Power	58	344	285
Geological	*	28	85
Industrial	87	767	710
Marine	13	18	39
Materials	*	48	98
Mechanical	129	418	322
Metallurgical	24	96	96
Mining	21	119	123
Nuclear	-	11	22
Petroleum	55	208	169
Surveying	23	44	34
Textile	*	17	17
Transportation	10	66	54
Engineering n.e.s.	129	765	923
Physical Science - Total	313	1,155	1,405
Chemical	96	517	593
Atm., Hydro., Litho.	44	229	410
Mathematics	124	215	151
Physics	49	194	251
Physical Science n.e.s.	-	-	-
Life Science - Total	166	902	823
Agriculture	82	359	289
Biology	43	165	224
Forestry	24	247	207
Veterinary	15	118	100
Life Science n.e.s.	*	13	*
Social Science - Total	139	760	851
Ec. and Stat.	130	455	603
Psychology	*	51	38
Sociology	*	18	25
Social Work	*	181	161
Social Science n.e.s.	*	55	24
Other Fields - Total	316	1,059	1,080
Not Stated	151	598	499
Final Total(1)	2,000	9,329	10,126

TABLE II.1

EMPLOYED IN CANADA, 1967
and by Age

35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64
501	403	269	111	157	62
4,970	6,424	5,107	¢,741	1,851	1,083
49	69	40	19	12	*
10	22	13	*	*	50
207	265	306	91	57	36
952	1,006	693	396	213	173
913	1,254	883	488	279	207
566	563	395	159	103	62
347	691	488	329	176	145
45	79	49	56	22	24
575	949	736	343	284	107
36	43	33	13	12	*
68	124	106	98	17	23
443	499	430	148	115	80
154	111	205	144	105	24
104	185	164	201	169	84
22	78	15	10	*	*
269	388	242	128	67	33
50	62	49	34	21	19
21	65	*	*	16	*
106	74	121	33	19	15
946	1,151	1,016	524	437	184
1,745	1,616	1,153	1,011	488	295
786	757	650	598	241	147
529	462	281	225	109	100
184	159	72	47	73	18
246	238	150	141	65	30
-	-	-	-	-	-
1,333	1,482	1,261	939	438	332
382	478	399	336	191	104
298	404	305	234	112	89
428	382	349	173	75	102
214	212	195	189	55	37
11	*	13	*	*	-
963	1,098	928	557	552	225
595	715	589	325	357	133
161	58	47	42	31	*
23	40	35	20	33	*
171	221	210	164	122	74
13	64	47	*	*	*
794	819	716	452	485	249
499	805	569	432	373	279
10,805	12,647	10,003	6,243	4,344	2,525

APPENDIX TABLE II.1 (continued)

Field of Principal Employment	65 and Over	Final Total(2)	Average Age
Architecture	46	2,205	40
Engineering - Total	570	33,485	41
Aeronautical	-	358	38
Ceramic	*	121	51
Chemical	*	1,549	39
Civil	44	5,440	39
Electrical - Total	178	6,329	40
Electronics	77	3,351	38
Power	101	2,978	43
Geological	*	401	42
Industrial	98	4,674	40
Marine	*	216	40
Materials	*	594	43
Mechanical	67	2,665	40
Metallurgical	*	976	43
Mining	68	1,242	46
Nuclear	-	162	40
Petroleum	-	1,572	40
Surveying	*	342	41
Textile	*	162	42
Transportation	*	507	40
Engineering n.e.s.	71	6,175	41
Physical Science - Total	58	9,298	40
Chemistry	32	4,438	41
Atm., Hydro., Litho.	17	2,426	41
Mathematics	*	1,051	37
Physics	*	1,383	39
Physical Science n.e.s.	-	-	-
Life Science - Total	89	7,793	42
Agriculture	30	2,658	42
Biology	23	1,903	42
Forestry	26	2,021	41
Veterinary	*	1,149	43
Life Science n.e.s.	*	62	41
Social Science - Total	68	6,175	42
Ec. and Stat.	39	3,957	41
Psychology	*	441	40
Sociology	*	207	44
Social Work	24	1,346	43
Social Science n.e.s.	*	224	40
Other Fields - Total	53	6,071	39
Not Stated	146	4,385	42
Final Total(1)	1,030	69,412	41

(1) Final total includes numbers less than 10 that were not quoted.
(2) Includes 'not stated' category.
- Not reported
* Less than 10

SCIENTISTS AND ENGINEERS
By Field of Principal Employment

Field of Principal Employment	Canada	United States
Architecture	1,509	30
Engineering - Total	26,400	681
Aeronautical	286	*
Ceramic	108	*
Chemical	1,222	21
Civil	4,137	52
Electrical - Total	5,064	78
Electronics	2,694	40
Power	2,370	38
Geological	339	26
Industrial	3,846	123
Marine	116	*
Materials	482	*
Mechanical	1,994	57
Metallurgical	776	16
Mining	1,052	39
Nuclear	120	*
Petroleum	1,283	78
Surveying	301	-
Textile	136	*
Transportation	417	18
Engineering n.e.s.	4,721	152
Physical Science - Total	6,726	256
Chemistry	3,165	90
Atm., Hydro., Litho.	1,802	112
Mathematics	829	31
Physics	930	23
Physical Science	-	-
Life Science - Total	6,547	198
Agriculture	2,399	34
Biology	1,421	118
Forestry	1,736	35
Veterinary	940	11
Life Science n.e.s.	51	-
Social Science - Total	5,098	226
Ec. and Stat.	3,349	99
Psychology	345	10
Sociology	151	24
Social Work	1,059	83
Social Science n.e.s.	194	10
Other Fields - Total	4,878	234
Not Stated	3,531	114
Final Total(1)	54,689	1,739

TABLE II.2

EMPLOYED IN CANADA, 1967
and Location of Birth

North America Other	Caribbean	Central America	South America
*	*	-	-
10	68	*	32
-	*	-	-
-	-	-	-
*	*	-	*
*	10	-	*
-	27	-	*
-	19	-	*
-	*	-	*
-	*	-	-
-	*	-	*
-	*	-	-
-	*	-	-
*	*	*	*
*	-	-	*
*	*	-	-
-	-	-	*
-	*	-	*
-	*	-	*
-	-	-	-
-	-	-	*
*	*	*	*
*	28	*	14
*	19	*	*
*	*	-	*
*	-	-	*
*	*	-	*
-	-	-	-
*	33	*	10
*	*	-	*
-	15	-	*
-	*	-	*
*	*	*	*
-	-	-	-
*	15	-	*
*	11	-	*
-	*	-	-
-	*	-	-
*	*	-	*
-	-	-	-
*	*	*	*
*	14	*	*
29	170	*	69

SCIENTISTS AND ENGINEERS
By Field of Principal Employment

Field of Principal Employment	Europe Total	United Kingdom
Architecture	578	280
Engineering - Total	4,945	2,294
Aeronautical	52	29
Ceramic	10	*
Chemical	203	86
Civil	979	352
Electrical - Total	889	474
Electronics	437	241
Power	452	233
Geological	26	13
Industrial	590	260
Marine	94	62
Materials	86	51
Mechanical	431	159
Metallurgical	153	99
Mining	115	64
Nuclear	35	31
Petroleum	187	101
Surveying	28	12
Textile	19	*
Transportation	56	29
Engineering n.e.s.	992	459
Physical Science - Total	1,777	985
Chemistry	958	509
Atm., Hydro., Litho.	392	252
Mathematics	135	66
Physics	292	158
Physical Science n.e.s.	-	-
Life Science - Total	814	310
Agriculture	180	64
Biology	255	125
Forestry	203	56
Veterinary	166	59
Life Science n.e.s.	10	*
Social Science - Total	665	317
Ec. and Stat.	392	204
Psychology	80	19
Sociology	24	10
Social Work	153	76
Social Science n.e.s.	16	*
Other Fields - Total	711	312
Not Stated	513	253
Final Total(1)	10,003	4,751

TABLE II.2 (continued)

EMPLOYED IN CANADA, 1967
and Location of Birth

France	Germany (Rep. of W.)	Irish Republic	Italy
*	27	*	52
51	242	24	103
*	*	-	-
-	-	-	-
*	16	*	*
11	55	12	65
*	55	*	16
*	25	*	*
*	30	*	*
-	*	-	-
*	25	*	*
*	*	-	-
-	*	-	*
*	24	-	*
*	*	-	*
-	10	-	-
-	-	-	-
*	*	-	*
-	*	-	-
-	-	-	-
-	*	-	-
*	32	*	*
24	101	*	14
*	52	*	*
*	19	*	*
*	12	*	*
*	18	*	*
-	-	-	-
16	58	*	*
-	12	-	*
*	18	*	*
*	12	*	-
11	15	*	*
-	*	-	-
*	52	*	*
*	29	*	*
*	*	*	-
-	*	-	-
-	13	*	*
-	-	-	-
*	24	*	51
17	23	*	*
127	527	56	238

SCIENTISTS AND ENGINEERS
By Field of Principal Employment

Field of Principal Employment	Netherlands	Norway
Architecture	10	*
Engineering - Total	230	44
Aeronautical	*	-
Ceramic	-	-
Chemical	11	*
Civil	53	11
Electrical - Total	29	*
Electronics	19	*
Power	10	*
Geological	-	-
Industrial	19	*
Marine	22	-
Materials	*	-
Mechanical	18	*
Metallurgical	*	*
Mining	*	*
Nuclear	-	-
Petroleum	32	*
Surveying	*	-
Textile	-	*
Transportation	*	-
Engineering n.e.s.	22	*
Physical Science - Total	61	*
Chemistry	31	*
Atm., Hydro., Litho.	22	*
Mathematics	*	-
Physics	*	*
Physical Science n.e.s.	-	-
Life Science - Total	51	*
Agriculture	11	*
Biology	13	-
Forestry	16	*
Veterinary	10	-
Life Science n.e.s.	*	-
Social Science - Total	74	*
Ec. and Stat.	16	*
Psychology	48	-
Sociology	*	-
Social Work	*	*
Social Science n.e.s.	-	-
Other Fields - Total	26	*
Not Stated	46	*
Final Total(1)	498	75

TABLE II.2 (continued)

EMPLOYED IN CANADA, 1967
and Location of Birth

Poland	Sweden	U.S.S.R.	Europe Other
87	-	49	60
520	18	609	810
*	*	*	*
-	-	*	*
20	-	24	37
127	*	128	163
70	*	101	124
30	*	45	59
40	*	56	65
*	-	*	*
35	*	98	133
*	-	*	*
*	-	*	16
104	*	38	72
*	-	11	17
*	*	13	15
*	-	-	*
10	*	12	21
*	-	*	*
*	-	*	*
*	-	11	*
110	*	153	183
98	*	151	325
40	*	64	239
34	*	21	32
11	-	10	27
13	*	56	27
-	-	-	-
45	*	134	173
20	-	52	19
*	-	30	50
*	*	15	79
*	-	37	23
-	-	-	*
38	*	43	115
25	*	23	77
*	-	*	*
*	-	-	*
*	*	16	24
-	-	*	*
131	*	44	105
38	*	44	77
957	35	1,074	1,665

SCIENTISTS AND ENGINEERS
By Field of Principal Employment

Field of Principal Employment	Oceania Total	Australia
Architecture	*	*
Engineering - Total	137	108
Aeronautical	*	-
Ceramic	-	-
Chemical	*	*
Civil	40	32
Electrical - Total	54	50
Electronics	49	47
Power	*	*
Geological	-	-
Industrial	*	*
Marine	*	-
Materials	*	*
Mechanical	*	*
Metallurgical	*	*
Mining	*	*
Nuclear	-	-
Petroleum	*	*
Surveying	*	-
Textile	-	-
Transportation	-	-
Engineering n.e.s.	10	*
Physical Science - Total	85	71
Chemistry	15	11
Atm., Hydro., Litho.	14	*
Mathematics	*	*
Physics	53	50
Physical Science n.e.s.	-	-
Life Science - Total	*	*
Agriculture	*	-
Biology	*	*
Forestry	-	-
Veterinary	-	-
Life Science n.e.s.	-	-
Social Science - Total	*	*
Ec. and Stat.	*	*
Psychology	-	-
Sociology	-	-
Social Work	*	*
Social Science n.e.s.	-	-
Other Fields - Total	*	*
Not Stated	11	*
Final Total(1)	260	200

TABLE II.2 (continued)

EMPLOYED IN CANADA, 1967
and Location of Birth

Oceania, Other	Asia Total	Hong Kong	India
*	17	*	*
29	489	87	139
*	*	*	*
-	*	-	*
*	15	*	*
*	126	12	20
*	104	12	29
*	61	*	22
*	43	*	*
-	*	-	*
*	48	*	31
*	*	-	-
-	*	-	*
*	43	*	17
*	11	-	*
*	*	-	*
-	*	*	-
-	*	-	*
*	*	*	-
-	*	-	-
-	*	-	*
*	102	54	15
14	217	12	98
*	90	*	34
*	50	-	21
*	30	*	13
*	47	*	30
-	-	-	-
*	78	*	27
*	13	-	*
*	43	*	17
-	13	-	*
-	*	-	*
-	*	-	-
*	65	*	30
*	44	*	21
-	*	-	*
-	*	*	-
*	13	-	*
-	*	-	*
*	47	*	27
*	35	*	12
60	948	113	336

SCIENTISTS AND ENGINEERS
By Field of Principal Employment

Field of Principal Employment	Asia, Other	Africa Total
Architecture	*	10
Engineering - Total	263	105
Aeronautical	*	-
Ceramic	*	-
Chemical	*	*
Civil	94	10
Electrical - Total	63	18
Electronics	34	*
Power	29	*
Geological	*	*
Industrial	15	11
Marine	*	*
Materials	*	*
Mechanical	24	27
Metallurgical	*	-
Mining	*	13
Nuclear	-	-
Petroleum	*	*
Surveying	-	*
Textile	*	-
Transportation	*	-
Engineering n.e.s.	33	13
Physical Science - Total	107	34
Chemistry	47	19
Atm., Hydro., Litho.	29	*
Mathematics	15	*
Physics	16	*
Physical Science n.e.s.	-	-
Life Science - Total	49	22
Agriculture	10	*
Biology	24	15
Forestry	11	*
Veterinary	*	*
Life Science n.e.s.	*	-
Social Science - Total	33	20
Ec. and Stat.	22	16
Psychology	*	-
Sociology	*	*
Social Work	*	*
Social Science n.e.s.	*	-
Other Fields - Total	17	14
Not Stated	21	10
Final Total(1)	499	215

(1) Final Total includes numbers less than 10 that were not quoted.
- Not reported
* Less than 10

EMPLOYED IN CANADA, 1967
and Location of Birth

Other Unspecified	Not Stated	Final Total
32	14	2,201
445	97	33,411
*	-	358
-	-	121
63	*	1,547
46	18	5,425
54	17	6,314
24	*	3,346
30	*	2,968
*	-	401
23	11	4,664
-	-	216
*	*	594
80	*	2,658
*	*	970
*	*	1,240
*	-	162
*	*	1,571
*	*	340
*	-	162
*	*	505
143	18	6,163
89	35	9,269
42	21	4,429
24	*	2,417
12	*	1,048
11	*	1,375
-	-	-
40	24	7,778
*	*	2,653
13	10	1,901
*	*	2,016
*	*	1,146
-	-	62
31	21	6,158
15	13	3,949
*	*	442
*	*	207
14	*	1,337
-	-	223
131	*	6,047
58	78	4,368
826	278	69,232

SCIENTISTS AND ENGINEERS
By Field of Principal Employment

Field of Principal Employment	Professional Certification	Bachelor Pass or 1st Professional Degree
Architecture	299	1,530
Engineering - Total	1,663	23,218
Aeronautical	10	176
Ceramic	-	104
Chemical	46	1,025
Civil	312	3,625
Electrical - Total	291	4,524
Electronics	101	2,357
Power	190	2,167
Geological	*	272
Industrial	275	3,243
Marine	44	123
Materials	26	488
Mechanical	96	1,768
Metallurgical	42	625
Mining	167	796
Nuclear	11	106
Petroleum	22	1,205
Surveying	34	250
Textile	*	119
Transportation	70	368
Engineering n.e.s.	206	4,401
Physical Science - Total	327	3,116
Chemistry	168	1,731
Atm., Hydro., Litho.	30	824
Mathematics	64	236
Physics	65	325
Physical Science n.e.s.	-	-
Life Science - Total	86	4,352
Agriculture	37	1,658
Biology	*	356
Forestry	37	1,382
Veterinary	*	934
Life Science n.e.s.	*	22
Social Science - Total	279	2,567
Ec. and Stat.	109	1,967
Psychology	33	228
Sociology	*	67
Social Work	133	299
Social Science n.e.s.	-	*
Other Fields - Total	103	2,742
Not Stated	220	2,721
Final Total(1)	2,977	40,246

(1) Final total includes numbers less than 10 that were not quoted.
(2) Total includes those who did not state level of education.
- Not reported
* Less than 10

TABLE II.3

EMPLOYED IN CANADA, 1967
and Level of Education

Bachelor Honours	Masters	Doctorate	Not Stated	Final Total(2)
186	170	*	10	2,199
4,603	3,189	643	88	33,404
45	110	17	-	358
*	*	*	-	120
316	109	48	*	1,546
589	773	122	*	5,426
940	463	80	16	6,314
550	261	67	*	3,345
390	202	13	*	2,969
53	41	25	*	401
735	382	20	10	4,665
18	27	-	*	216
33	33	10	*	593
457	231	101	*	2,657
124	111	63	*	972
120	112	32	11	1,238
27	13	*	-	162
220	103	18	*	1,569
38	16	*	*	340
18	10	12	*	162
33	32	*	-	505
830	617	84	22	6,160
1,635	1,691	2,475	23	9,267
837	610	1,065	16	4,427
340	665	552	*	2,416
331	196	223	-	1,050
127	220	635	*	1,374
-	-	-	-	-
895	1,179	1,249	18	7,779
302	374	277	*	2,653
236	435	862	*	1,901
235	281	75	*	2,017
112	79	17	*	1,146
10	10	18	-	62
670	2,133	481	27	6,157
547	1,056	251	19	3,949
46	111	23	-	441
28	54	53	*	207
39	845	15	*	1,338
10	67	139	-	222
1,502	1,157	528	16	6,048
568	570	237	52	4,368
10,059	10,089	5,617	234	69,222

SCIENTISTS AND ENGINEERS
By Field of Study for Highest Degree, Level of

Field of Study	Level of	
	Canada	United States
Architecture	315	-
Engineering - Total	1,559	10
Aeronautical	21	-
Ceramic	-	*
Chemical	72	*
Civil	453	-
Electrical	395	*
Engineering Science	*	-
Geological	*	-
Industrial	14	*
Marine	18	-
Materials	*	-
Mechanical	281	*
Metallurgical	27	-
Mining	182	-
Nuclear	*	-
Petroleum	*	-
Surveying	10	-
Textile	*	-
Transportation	*	-
Engineering n.e.s.	68	*
Physical Science - Total	275	*
Chemistry	144	*
Atm., Hydro., Litho.	39	*
Mathematics	85	-
Physics	*	-
Physical Science n.e.s.	*	-
Life Science - Total	106	-
Agriculture	77	-
Biology	*	-
Forestry	23	-
Veterinary	*	-
Life Science n.e.s.	-	-
Social Science - Total	124	-
Ec. and Stat.	*	-
Psychology	-	-
Sociology	*	-
Social Work	118	-
Social Science n.e.s.	*	-
Other Fields - Total	63	*
Not Stated	250	*
Final Total(1)	2,692	18

TABLE II.4

EMPLOYED IN CANADA, 1967
Education, and Country of Highest Degree

Education and Country of Highest Degree			
Professional Certification			
United Kingdom	Other	Not Stated	Total
20	*	-	337
113	*	*	1,687
*	-	-	23
-	-	-	*
*	-	*	76
55	-	-	508
*	*	-	409
-	-	-	*
-	-	-	*
-	-	-	16
17	-	-	35
-	-	-	*
13	*	*	297
*	-	-	28
*	-	-	187
*	-	-	*
-	-	-	*
-	-	-	10
-	-	-	*
-	-	-	*
*	*	-	78
18	*	*	305
17	*	*	169
*	*	*	43
-	*	-	86
-	-	-	*
-	-	-	*
*	-	*	109
*	-	-	78
-	-	*	*
-	-	-	23
*	-	-	*
-	-	-	-
*	*	*	132
-	-	-	*
-	-	-	-
-	-	-	*
*	*	*	126
-	-	-	*
*	-	-	66
11	*	73	340
168	14	84	2,976

SCIENTISTS AND ENGINEERS
By Field of Study for Highest Degree, Level of

Field of Study	Level of	
	Bachelor	
	Canada	United States
Architecture	1,420	43
Engineering - Total	24,381	1,024
Aeronautical	160	26
Ceramic	117	*
Chemical	2,949	166
Civil	6,349	192
Electrical	5,509	130
Engineering Science	431	*
Geological	268	39
Industrial	199	25
Marine	*	*
Materials	*	-
Mechanical	5,279	144
Metallurgical	521	19
Mining	1,291	86
Nuclear	*	*
Petroleum	172	167
Surveying	92	-
Textile	*	*
Transportation	*	*
Engineering n.e.s.	1,024	19
Physical Science - Total	3,260	123
Chemistry	1,350	27
Atm., Hydro., Litho.	796	81
Mathematics	520	*
Physics	504	*
Physical Science n.e.s.	90	*
Life Science - Total	5,022	110
Agriculture	2,976	11
Biology	304	14
Forestry	872	81
Veterinary	870	*
Life Science n.e.s.	-	-
Social Science - Total	429	66
Ec. and Stat.	137	60
Psychology	24	-
Sociology	12	*
Social Work	229	*
Social Science n.e.s.	27	*
Other Fields - Total	1,395	41
Not Stated	541	26
Final Total(1)	36,448	1,433

TABLE II.4 (continued)

EMPLOYED IN CANADA, 1967
Education, and Country of Highest Degree

Education and Country of Highest Degree			
Pass or First Professional Degree			
United Kingdom	Other	Not Stated	Total
152	55	*	1,678
638	687	145	26,875
10	*	*	206
-	-	*	122
13	52	*	3,189
234	284	72	7,131
149	87	15	5,890
*	*	*	439
*	-	*	309
*	*	*	236
*	*	*	15
-	-	*	*
172	191	22	5,808
*	*	*	549
25	14	*	1,421
*	-	-	*
*	*	*	350
*	*	*	98
*	*	-	*
-	*	-	10
*	24	*	1,082
138	39	40	3,600
57	28	*	1,467
*	*	25	914
10	*	*	543
17	*	*	534
47	*	*	142
66	113	29	5,340
27	14	*	3,034
*	*	*	326
14	45	*	1,014
23	49	20	966
-	-	-	-
20	11	*	533
10	*	*	212
*	*	*	27
-	*	-	15
*	*	*	247
*	*	-	32
22	18	19	1,495
33	29	100	729
1,069	952	348	40,250

SCIENTISTS AND ENGINEERS
By Field of Study for Highest Degree, Level of

Field of Study	Level of	
	Canada	United States
Architecture	146	*
Engineering - Total	4,405	176
Aeronautical	20	*
Ceramic	*	*
Chemical	582	12
Civil	936	23
Electrical	1,070	38
Engineering Science	212	-
Geological	98	*
Industrial	38	*
Marine	-	-
Materials	*	*
Mechanical	904	43
Metallurgical	106	*
Mining	255	22
Nuclear	*	-
Petroleum	*	*
Surveying	14	-
Textile	-	*
Transportation	*	-
Engineering n.e.s.	152	*
Physical Science - Total	2,180	45
Chemistry	869	*
Atm., Hydro., Litho.	355	28
Mathematics	572	*
Physics	318	*
Physical Science n.e.s.	66	*
Life Science - Total	1,425	19
Agriculture	735	*
Biology	334	*
Forestry	258	*
Veterinary	98	*
Life Science n.e.s.	-	-
Social Science - Total	165	*
Ec. and Stat.	97	*
Psychology	*	-
Sociology	12	-
Social Work	17	*
Social Science n.e.s.	36	-
Other Fields - Total	248	*
Not Stated	103	*
Final Total(1)	8,672	261

TABLE II.4 (continued)

EMPLOYED IN CANADA, 1967
Education, and Country of Highest Degree

Education and Country of Highest Degree			
Bachelor - Honours			
United Kingdom	Other	Not Stated	Total
22	15	*	191
416	303	28	5,328
*	-	-	28
-	-	-	*
26	14	*	636
123	40	*	1,130
60	64	*	1,238
*	*	-	218
*	-	*	112
-	-	-	45
*	-	-	*
*	-	-	*
100	126	*	1,177
10	49	*	172
21	*	*	303
-	-	-	*
49	-	*	60
-	-	-	14
-	*	-	*
-	-	-	*
10	*	*	169
161	34	12	2,432
79	24	*	986
25	*	*	411
20	*	*	605
32	*	*	356
*	*	-	74
15	20	10	1,489
-	*	*	757
12	*	*	355
*	*	*	270
*	*	-	107
-	-	-	-
20	*	*	201
14	*	*	124
*	-	*	*
-	-	-	12
-	*	-	19
*	-	-	41
*	*	*	270
17	19	*	146
660	401	63	10,057

APPENDIX

SCIENTISTS AND ENGINEERS
By Field of Study for Highest Degree, Level of

Field of Study	Level of	
	Canada	United States
Architecture	39	95
Engineering - Total	1,755	645
Aeronautical	75	25
Ceramic	*	*
Chemical	100	15
Civil	457	174
Electrical	311	73
Engineering Science	51	*
Geological	99	11
Industrial	31	24
Marine	*	*
Materials	14	*
Mechanical	262	87
Metallurgical	67	38
Mining	73	10
Nuclear	*	*
Petroleum	19	38
Surveying	*	-
Textile	-	*
Transportation	*	13
Engineering n.e.s.	177	109
Physical Science - Total	1,572	179
Chemistry	554	44
Atm., Hydro., Litho.	606	70
Mathematics	143	29
Physics	269	36
Physical Science n.e.s.	-	-
Life Science - Total	836	460
Agriculture	267	103
Biology	462	187
Forestry	91	115
Veterinary	13	54
Life Science n.e.s.	*	*
Social Science - Total	1,787	392
Ec. and Stat.	759	274
Psychology	105	15
Sociology	30	10
Social Work	783	86
Social Science n.e.s.	110	*
Other Fields - Total	312	120
Not Stated	309	110
Final Total(1)	6,610	2,001

EMPLOYED IN CANADA, 1967
Education, and Country of Highest Degree

Education and Country of Birth			
Masters Degree			
United Kingdom	Other	Not Stated	Total
*	18	*	161
236	388	56	3,080
16	15	*	133
*	*	*	*
11	24	*	152
62	94	26	813
37	70	*	495
*	*	*	72
*	*	*	116
*	64	*	129
*	*	*	16
*	*	-	23
32	39	*	429
13	10	*	131
*	*	-	93
-	-	-	*
*	*	-	60
*	-	-	*
*	-	-	*
*	*	-	23
36	44	*	370
92	67	26	1,936
14	24	13	649
39	22	*	742
16	*	*	199
23	12	*	346
-	-	-	-
13	29	13	1,351
*	*	*	381
*	*	*	671
*	18	*	227
*	-	-	68
-	-	-	*
52	30	28	2,289
33	25	11	1,102
*	-	-	121
*	-	*	44
*	*	15	895
*	*	-	127
19	*	*	464
101	38	255	813
520	579	384	10,094

SCIENTISTS AND ENGINEERS
By Field of Study for Highest Degree, Level of

Field of Study	Level of	
	Canada	United States
Architecture	-	-
Engineering - Total	165	163
Aeronautical	*	*
Ceramic	-	*
Chemical	30	17
Civil	12	27
Electrical	22	26
Engineering Science	*	*
Geological	11	11
Industrial	*	*
Marine	-	-
Materials	*	-
Mechanical	36	41
Metallurgical	21	*
Mining	-	-
Nuclear	-	*
Petroleum	*	*
Surveying	-	-
Textile	-	-
Transportation	-	*
Engineering n.e.s.	10	14
Physical Science - Total	1,406	636
Chemistry	724	189
Atm., Hydro., Litho.	269	218
Mathematics	64	74
Physics	349	155
Physical Science n.e.s.	-	-
Life Science - Total	536	643
Agriculture	41	160
Biology	474	454
Forestry	12	20
Veterinary	*	*
Life Science n.e.s.	*	*
Social Science - Total	54	307
Ec. and Stat.	28	194
Psychology	*	*
Sociology	*	37
Social Work	*	*
Social Science n.e.s.	15	64
Other Fields - Total	16	31
Not Stated	73	92
Final Total (1)	2,250	1,872

TABLE II.4 (continued)

EMPLOYED IN CANADA, 1967
Education, and Country of Highest Degree

Education and Country of Highest Degree			
Doctorate Degree			
United Kingdom	Other	Not Stated	Total
-	*	*	*
180	49	*	564
*	*	-	13
*	*	-	*
17	*	*	72
64	11	*	116
26	*	-	79
*	*	-	18
*	*	-	25
-	-	-	*
-	-	-	-
*	*	-	*
27	10	*	116
19	*	*	52
*	-	-	*
-	-	-	*
*	-	-	*
-	-	-	-
-	-	-	-
-	-	-	*
*	*	-	38
430	258	38	2,768
184	142	16	1,255
78	44	10	619
16	25	*	181
152	47	10	713
-	-	-	-
163	53	20	1,415
*	*	*	217
148	42	19	1,137
*	*	-	38
*	*	-	17
*	-	-	*
48	31	*	446
33	27	*	285
*	-	-	20
*	*	*	45
-	*	-	*
10	*	*	91
*	15	*	70
39	37	107	348
867	446	180	5,615

APPENDIX TABLE II.4 (continued)

Field of Study	Not Stated	Final Total
Architecture	-	2,371
Engineering - Total	-	37,534
Aeronautical	-	403
Ceramic	-	144
Chemical	-	4,125
Civil	-	9,698
Electrical	-	8,111
Engineering Science	-	753
Geological	-	565
Industrial	-	434
Marine	-	71
Materials	-	42
Mechanical	-	7,827
Metallurgical	-	932
Mining	-	2,013
Nuclear	-	17
Petroleum	-	478
Surveying	-	130
Textile	-	15
Transportation	-	39
Engineering n.e.s.	-	1,737
Physical Science - Total	-	11,041
Chemistry	-	4,526
Atm., Hydro., Litho.	-	2,729
Mathematics	-	1,614
Physics	-	1,952
Physical Science n.e.s.	-	220
Life Science - Total	-	9,704
Agriculture	-	4,467
Biology	-	2,494
Forestry	-	1,572
Veterinary	-	1,161
Life Science n.e.s.	-	10
Social Science - Total	-	3,601
Ec. and Stat.	-	1,725
Psychology	-	173
Sociology	-	119
Social Work	-	1,292
Social Science n.e.s.	-	292
Other Fields - Total	-	2,365
Not Stated	234	2,610
Final Total (1)	234	69,226

(1) Final Total includes numbers less than 10 that were not quoted.
\- Not reported
* Less than 10

SCIENTISTS AND ENGINEERS
By Sector of Employment and

Sector of Employment	Architecture	Engineering Total
Primary Industry - Total	-	2,355
Farm Agricultural, Vet. Service	-	54
Forest Service or Operation	-	104
Fisheries or Fishing Operation	-	*
Mine, Quarry, Oil Well	-	2,188
Manufacturing - Total	11	12,738
Food and Bev.	-	336
Tobacco	-	20
Rubber	-	89
Leather	-	12
Textiles	-	217
Knitting Mills	-	*
Clothing	-	*
Wood	-	122
Furniture and Fixture	-	21
Paper	*	1,117
Printing and Publishing	*	73
Primary Metal	*	1,353
Metal Fabrication	-	424
Machinery	*	1,173
Transport Equipment	-	971
Electrical	-	2,513
Non-Metallic Mineral	*	254
Petroleum and Coal	*	1,352
Chemical	*	1,866
Miscellaneous Manufacturing	*	819
Construction Firm	25	1,978
Transportation Org. or Service	*	1,013
Communications Organization	*	1,105
Utility	*	2,282
Trade Outlet	*	509
Financial Institution	18	126
Health or Welfare Organization	*	28
Professional Service	1,846	4,396
Other Organization or Service	*	146
Education - Total	40	1,171
Elementary, Secondary School	14	208
Vocational School	*	16
Institute of Technology	*	146
University, College	21	796
Other Educational Organization	-	*
Government - Total	164	5,199
Provincial	41	1,360
Armed Forces	*	1,023
Federal Department or Agency	79	1,738
Local Department or Agency	36	1,077
Foreign Government	-	*
Final Total(1)	2,198	33,412

TABLE II.5

EMPLOYED IN CANADA, 1967
Field of Principal Employment

Aeronautical	Ceramic	Chemical	Civil
*	*	47	92
-	-	-	10
-	-	*	59
*	-	*	*
-	*	39	22
165	56	1,169	520
-	-	35	*
-	-	*	-
-	-	18	*
*	-	*	*
*	*	26	*
-	-	*	-
-	-	-	-
-	*	*	*
-	-	*	-
*	*	121	50
*	-	*	*
-	*	45	148
*	*	16	27
*	*	27	40
131	*	33	24
11	*	31	22
-	23	*	95
-	*	129	20
*	*	613	46
*	*	54	27
11	*	17	406
20	-	*	387
*	-	*	*
*	*	23	211
*	*	18	45
-	-	*	11
*	-	*	*
*	*	160	1,632
-	-	*	10
18	*	43	139
*	-	10	*
*	-	-	*
-	-	*	13
15	*	31	113
-	-	-	*
122	*	47	1,784
*	-	13	699
69	-	*	38
46	*	25	580
*	-	*	467
-	-	-	-
358	121	1,547	5,428

SCIENTISTS AND ENGINEERS
By Sector of Employment and

Sector of Employment	Electrical Total	Electronics
Primary Industry - Total	58	30
Farm Agricultural, Vet. Service	*	*
Forest Service or Operation	*	-
Fisheries or Fishing Operation	-	-
Mine, Quarry, Oil Well	54	27
Manufacturing - Total	2,392	1,439
Food and Bev.	10	*
Tobacco	*	-
Rubber	*	*
Leather	-	-
Textiles	*	*
Knitting Mills	-	-
Clothing	*	*
Wood	*	*
Furniture and Fixture	*	*
Paper	67	*
Printing and Publishing	12	11
Primary Metal	69	19
Metal Fabrication	46	23
Machinery	269	216
Transport Equipment	73	42
Electrical	1,486	906
Non-Metallic Mineral	*	*
Petroleum and Coal	29	20
Chemical	129	27
Miscellaneous Manufacturing	186	150
Construction Firm	76	21
Transportation Org. or Service	58	39
Communications Organization	918	900
Utility	1,318	91
Trade Outlet	74	49
Financial Institution	*	-
Health or Welfare Organization	-	-
Professional Service	516	101
Other Organization or Service	26	23
Education - Total	177	129
Elementary, Secondary School	*	*
Vocational School	*	*
Institute of Technology	28	25
University, College	136	97
Other Educational Organization	*	*
Government - Total	584	423
Provincial	52	27
Armed Forces	189	179
Federal Department or Agency	290	206
Local Department or Agency	53	11
Foreign Government	-	-
Final Total(1)	6,314	3,345

TABLE II.5 (continued)

EMPLOYED IN CANADA, 1967
Field of Principal Emloyment

Power	Geological	Industrial	Marine
28	273	177	*
-	*	15	-
*	-	12	-
-	-	*	-
27	265	149	*
953	41	2,614	20
*	-	82	*
*	-	*	-
*	-	21	-
-	-	*	-
-	-	33	-
-	-	-	-
-	-	*	-
-	-	23	-
-	-	14	-
58	*	363	*
*	-	27	-
50	*	360	*
23	*	150	*
53	*	200	-
31	-	191	10
580	*	368	*
*	-	57	-
*	29	155	*
102	*	437	-
36	*	122	-
55	*	366	*
19	*	61	*
18	-	95	-
1,227	*	245	-
25	-	46	*
*	*	17	-
-	-	*	-
415	40	223	42
*	-	14	-
48	*	115	*
*	*	13	-
*	-	*	-
*	-	*	*
39	*	96	*
-	-	*	-
161	27	660	133
25	13	187	*
10	-	222	62
84	14	168	67
42	-	82	-
-	-	*	-
2,969	400	4,665	216

SCIENTISTS AND ENGINEERS
By Sector of Employment and

Sector of Employment	Materials	Mechanical
Primary Industry - Total	34	46
Farm Agricultural, Vet. Service	*	*
Forest Service or Operation	*	*
Fisheries or Fishing Operation	-	*
Mine, Quarry, Oil Well	32	36
Manufacturing - Total	276	1,299
Food and Bev.	55	15
Tobacco	*	*
Rubber	*	*
Leather	*	-
Textiles	*	*
Knitting Mills	-	-
Clothing	-	-
Wood	59	*
Furniture and Fixture	*	*
Paper	11	126
Printing and Publishing	*	10
Primary Metal	23	89
Metal Fabrication	10	65
Machinery	31	315
Transport Equipment	16	219
Electrical	15	159
Non-Metallic Mineral	*	*
Petroleum and Coal	*	34
Chemical	14	90
Miscellaneous Manufacturing	19	145
Construction Firm	16	211
Transportation Org. or Service	*	17
Communications Organization	*	11
Utility	12	148
Trade Outlet	73	76
Financial Institution	*	*
Health or Welfare Organization	-	-
Professional Service	80	424
Other Organization or Service	*	*
Education - Total	11	205
Elementary, Secondary School	-	*
Vocational School	-	-
Institute of Technology	*	47
University, College	10	149
Other Educational Organization	-	-
Government - Total	76	191
Provincial	*	42
Armed Forces	57	46
Federal Department or Agency	*	93
Local Department or Agency	*	10
Foreign Government	-	-
Final Total(1)	595	2,657

EMPLOYED IN CANADA, 1967
Field of Principal Employment

Metallurgical	Mining	Nuclear	Petroleum
326	771	-	360
*	-	-	*
-	-	-	-
-	-	-	-
325	771	-	359
463	134	116	870
-	-	-	-
-	-	-	-
*	-	-	*
-	-	-	-
-	-	-	-
-	-	-	-
*	-	-	-
*	*	-	*
-	-	-	-
*	*	-	*
-	-	-	-
268	12	-	*
22	*	-	*
20	12	-	*
63	*	*	*
16	*	63	-
*	11	-	*
10	*	-	821
31	82	*	14
21	*	47	*
*	20	*	29
*	*	-	92
-	-	-	*
*	*	10	37
*	10	*	13
*	*	-	*
*	*	-	*
56	175	26	96
*	*	-	*
28	41	*	*
-	*	-	*
-	-	-	-
*	25	-	*
27	15	*	*
-	-	-	-
64	69	*	53
*	41	-	39
*	*	*	*
50	21	*	11
-	*	-	*
-	-	-	-
972	1,238	162	1,569

SCIENTISTS AND ENGINEERS
By Sector of Employment and

Sector of Employment	Surveying	Textile
Primary Industry - Total	18	-
Farm Agricultural, Vet. Service	-	-
Forest Service or Operation	*	-
Fisheries or Fishing Operation	-	-
Mine-Quarry, Oil Well	15	-
Manufacturing - Total	16	155
Food and Bev.	*	-
Tobacco	-	-
Rubber	-	*
Leather	-	*
Textiles	-	110
Knitting Mills	-	-
Clothing	-	-
Wood	-	-
Furniture and Fixture	-	-
Paper	*	*
Printing and Publishing	-	-
Primary Metal	*	-
Metal Fabrication	-	*
Machinery	-	-
Transport Equipment	-	*
Electrical	-	*
Non-Metallic Mineral	-	-
Petroleum and Coal	*	*
Chemical	*	35
Miscellaneous Manufacturing	-	*
Construction Firm	*	-
Transportation Org. or Service	*	-
Communications Organization	*	-
Utility	*	-
Trade Outlet	*	*
Financial Institution	*	-
Health or Welfare Organization	-	-
Professional Service	141	*
Other Organization or Service	-	-
Education - Total	17	*
Elementary, Secondary School	*	*
Vocational School	*	-
Institute of Technology	-	-
University, College	13	-
Other Educational Organization	-	-
Government - Total	121	*
Provincial	24	-
Armed Forces	10	-
Federal Department or Agency	64	*
Local Department or Agency	23	-
Foreign Government	-	-
Final Total(1)	340	162

TABLE II.5 (continued)

EMPLOYED IN CANADA, 1967
Field of Principal Employment

Transport	Engineering n.e.s.	Physical Science Total	Chemistry
*	146	889	128
-	*	56	52
-	20	*	*
-	*	18	12
*	115	807	59
22	2,410	3,334	2,575
-	133	373	368
-	*	*	*
-	27	55	50
-	*	*	*
-	27	60	58
-	*	-	-
-	*	-	-
-	15	14	14
-	*	*	*
*	353	210	195
-	16	14	*
*	319	171	126
*	63	29	13
*	242	128	*
11	192	29	11
*	326	235	33
-	35	41	32
-	110	378	189
-	358	1,269	1,239
-	181	316	217
*	697	21	*
241	105	40	12
*	65	29	*
*	254	65	19
-	136	77	60
-	74	209	10
-	10	90	70
94	680	399	75
*	82	65	61
*	349	2,090	752
-	148	245	74
-	*	28	10
-	24	104	65
*	171	1,707	601
-	*	*	*
123	1,133	1,910	636
23	203	342	126
*	307	216	60
*	281	1,340	445
90	342	12	*
-	-	-	-
505	6,163	9,269	4,430

SCIENTISTS AND ENGINEERS
By Sector of Employment and

Sector of Employment	Atm., Hydro., Litho.	Mathematics
Primary Industry - Total	742	10
Farm Agricultural, Vet. Service	*	*
Forest Service or Operation	*	*
Fisheries or Fishing Operation	*	*
Mine, Quarry, Oil Well	734	*
Manufacturing - Total	176	247
Food and Bev.	*	*
Tobacco	-	-
Rubber	-	*
Leather	-	-
Textiles	-	*
Knitting Mills	-	-
Clothing	-	-
Wood	-	-
Furniture and Fixture	-	-
Paper	*	10
Printing and Publishing	*	*
Primary Metal	*	19
Metal Fabrication	*	14
Machinery	*	105
Transport Equipment	*	*
Electrical	-	21
Non-Metallic Mineral	*	-
Petroleum and Coal	147	38
Chemical	*	*
Miscellaneous Manufacturing	*	12
Construction Firm	*	*
Transportation Org. or Service	16	*
Communications Organization	*	-
Utility	23	*
Trade Outlet	*	11
Financial Institution	*	193
Health or Welfare Organization	*	*
Professional Service	209	44
Other Organization or Service	*	-
Education - Total	411	415
Elementary, Secondary School	48	70
Vocational School	-	18
Institute of Technology	*	*
University, College	353	321
Other Educational Organization	*	-
Government - Total	808	101
Provincial	163	11
Armed Forces	26	34
Federal Department or Agency	613	55
Local Department or Agency	*	*
Foreign Government	-	-
Final Total(1)	2,414	1,050

TABLE II.5 (continued)

EMPLOYED IN CANADA, 1967
Field of Principal Employment

Physics	Physical Science n.e.s.	Life Science Total	Agriculture
*	-	1,819	549
-	-	1,233	499
-	-	526	*
*	-	29	13
*	-	31	31
336	-	970	291
*	-	223	136
-	-	*	*
*	-	-	-
-	-	-	-
*	-	*	*
-	-	-	-
-	-	-	-
-	-	103	-
-	-	*	-
*	-	393	*
-	-	*	*
20	-	*	*
*	-	-	-
12	-	11	10
*	-	*	*
181	-	*	*
*	-	*	*
*	-	*	*
12	-	195	125
82	-	13	*
*	-	17	13
*	-	*	*
27	-	*	-
15	-	17	11
*	-	63	41
*	-	29	26
17	-	101	*
71	-	154	71
*	-	29	13
512	-	1,035	219
53	-	136	27
-	-	15	*
27	-	19	*
432	-	854	182
-	-	11	-
365	-	3,454	1,369
42	-	1,630	730
96	-	30	*
227	-	1,732	606
-	-	61	25
-	-	*	*
1,375	-	7,780	2,656

SCIENTISTS AND ENGINEERS
By Sector of Employment and

Sector of Employment	Biology	Forestry
Primary Industry - Total	76	505
Farm Agricultural, Vet. Service	44	*
Forest Service or Operation	17	502
Fisheries or Fishing Operation	15	*
Mine, Quarry, Oil Well	-	-
Manufacturing - Total	159	508
Food and Bev.	82	-
Tobacco	-	-
Rubber	-	-
Leather	-	-
Textiles	-	-
Knitting Mills	-	-
Clothing	-	-
Wood	*	101
Furniture and Fixture	-	*
Paper	*	388
Printing and Publishing	-	*
Primary Metal	*	-
Metal Fabrication	-	-
Machinery	*	-
Transport Equipment	-	*
Electrical	*	*
Non-Metallic Mineral	*	-
Petroleum and Coal	*	-
Chemical	58	*
Miscellaneous Manufacturing	*	*
Construction Firm	*	-
Transportation Org. or Service	*	*
Communications Organization	-	*
Utility	*	*
Trade Outlet	*	15
Financial Institution	*	-
Health or Welfare Organization	72	-
Professional Service	14	49
Other Organization or Service	*	*
Education - Total	661	105
Elementary, Secondary School	48	59
Vocational School	*	*
Institute of Technology	*	*
University, College	590	35
Other Educational Organization	10	*
Government - Total	877	810
Provincial	217	590
Armed Forces	17	*
Federal Department or Agency	639	210
Local Department or Agency	*	*
Foreign Government	-	-
Final Total(1)	1,900	2,016

EMPLOYED IN CANADA, 1967
Field of Principal Employment

Veterinary	Life Science n.e.s.	Social Science Total	Ec. and Stat.
689	-	195	177
688	-	86	81
*	-	13	13
-	-	*	*
-	-	95	82
11	*	1,524	1,458
*	-	141	136
-	-	*	*
-	-	11	10
-	-	*	*
-	-	15	14
-	-	-	-
-	-	*	*
-	-	35	34
-	-	*	*
-	-	84	79
-	-	18	15
-	-	173	164
-	-	69	68
-	-	117	114
-	-	43	41
*	-	240	233
-	-	34	31
-	-	153	147
*	*	312	296
-	-	67	66
-	-	60	59
*	*	70	66
-	-	36	27
-	-	84	73
*	-	174	171
-	-	445	440
12	13	854	*
12	*	245	205
-	*	81	36
40	10	900	318
*	*	217	11
-	-	*	*
*	-	*	*
38	*	667	300
-	-	*	*
372	26	1,435	880
82	11	491	219
*	*	59	37
269	*	830	611
19	*	54	12
-	-	*	*
1,146	62	6,156	3,950

SCIENTISTS AND ENGINEERS
By Sector of Employment and

Sector of Employment	Psychology	Sociology
Primary Industry - Total	13	*
Farm Agricultural, Vet. Service	*	*
Forest Service or Operation	-	-
Fisheries or Fishing Operation	-	-
Mine, Quarry, Oil Well	12	*
Manufacturing - Total	56	*
Food and Bev.	*	*
Tobacco	*	-
Rubber	*	-
Leather	-	-
Textiles	-	-
Knitting Mills	-	-
Clothing	*	-
Wood	*	-
Furniture and Fixture	-	-
Paper	*	-
Printing and Publishing	*	*
Primary Metal	*	-
Metal Fabrication	*	-
Machinery	*	*
Transport Equipment	*	-
Electrical	*	*
Non-Metallic Mineral	*	-
Petroleum and Coal	*	*
Chemical	15	*
Miscellaneous Manufacturing	*	-
Construction Firm	*	-
Transportation Org. or Service	*	-
Communications Organization	*	-
Utility	11	-
Trade Outlet	*	-
Financial Institution	*	-
Health or Welfare Organization	*	*
Professional Service	17	11
Other Organization or Service	*	11
Education - Total	159	103
Elementary, Secondary School	122	37
Vocational School	*	-
Institute of Technology	*	*
University, College	34	64
Other Educational Organization	-	*
Government - Total	148	67
Provincial	20	23
Armed Forces	10	*
Federal Department or Agency	117	40
Local Department or Agency	*	*
Foreign Government	-	-
Final Total(1)	440	207

(1) Final total includes those who did not state their sector of employment.
(2) Number reporting includes those who did not state their field of principal employment.

- Not reported * Less than 10

TABLE II.5 (continued)

EMPLOYED IN CANADA, 1967
Field of Principal Employment

Social Work	Social Science n.e.s.	Other Fields	Final Total(2)
*	-	37	5,680
*	-	12	1,600
-	-	*	680
-	-	*	64
-	-	19	3,336
*	*	372	20,224
*	-	20	1,182
-	-	*	32
-	-	*	167
-	-	*	24
-	*	60	370
-	-	-	*
-	-	-	*
-	-	*	294
-	-	-	30
-	-	21	1,985
-	-	18	198
-	*	25	1,811
-	-	*	560
-	-	24	1,526
-	-	11	1,201
*	-	33	3,198
-	-	*	361
-	-	20	2,011
-	-	60	3,941
-	-	58	1,323
-	-	56	2,361
-	-	26	1,238
*	-	*	1,215
-	-	24	2,579
*	-	40	965
*	*	44	945
835	-	73	1,217
12	-	158	7,641
29	-	43	448
117	203	4,174	10,024
45	*	2,871	3,904
-	-	114	186
*	-	222	571
69	200	947	5,309
*	*	20	54
324	16	923	13,846
218	11	256	4,364
10	*	184	1,640
58	*	395	6,460
38	-	87	1,378
-	-	*	*
1,337	222	6,050	69,234

SCIENTISTS AND ENGINEERS
By Sector of Employment

Sector of Employment	Professional Certification	Bachelor Pass or 1st Prof. Degree
Primary Industry - Total	295	3,945
Farm Agricultural, Vet. Service	16	1,261
Forest Service or Operation	*	496
Fisheries or Fishing Operation	*	23
Mine, Quarry, Oil Well	270	2,165
Manufacturing - Total	810	13,409
Food and Bev.	45	844
Tobacco	*	25
Rubber	*	100
Leather	*	14
Textiles	16	266
Knitting Mills	-	*
Clothing	-	*
Wood	*	219
Furniture and Fixture	-	17
Paper	55	1,470
Printing and Publishing	*	142
Primary Metal	75	1,273
Metal Fabrication	25	359
Machinery	72	1,017
Transport Equipment	50	750
Electrical	232	2,108
Non-Metallic Mineral	*	272
Petroleum and Coal	25	1,317
Chemical	124	2,474
Miscellaneous Manufacturing	61	736
Construction Firm	117	1,840
Transportation Org. or Service	54	938
Communications Organization	28	990
Utility	144	1,831
Trade Outlet	48	695
Financial Institution	92	525
Health or Welfare Organization	100	312
Professional Service	479	4,836
Other Organization or Service	15	276
Education - Total	94	2,747
Elementary, Secondary School	55	1,741
Vocational School	-	88
Institute of Technology	17	287
University, College	21	617
Other Educational Organization	*	14
Government - Total	620	7,370
Provincial	148	2,736
Armed Forces	35	1,036
Federal Department or Agency	292	2,748
Local Department or Agency	145	849
Foreign Government	-	*
Final Total(1)	2,979	40,246

(1) Final total includes those who did not state their sector of employment
(2) Number reporting includes those who did not state level of education.

\- Not reported * Less than 10

TABLE II.6

EMPLOYED IN CANADA, 1967
and Level of Education

Bachelor Honours	Masters	Doctorate	Final Total(2)
690	519	187	5,681
201	96	24	1,601
62	73	38	680
*	28	*	64
422	322	119	3,336
3,385	1,998	558	20,222
163	88	37	1,181
*	*	*	32
38	15	*	167
*	*	-	24
48	28	*	369
*	-	-	*
*	-	-	*
48	22	-	294
*	*	-	30
306	111	40	1,986
30	19	*	198
241	184	35	1,811
134	37	*	559
283	141	*	1,526
192	202	*	1,201
563	233	53	3,197
44	28	*	361
343	270	53	2,011
647	449	229	3,942
285	163	75	1,323
240	155	*	2,360
148	86	10	1,237
136	60	-	1,215
377	210	10	2,580
117	85	*	964
203	100	21	944
94	638	67	1,217
1,032	1,063	219	7,641
35	106	12	446
1,873	2,386	2,912	10,021
1,325	742	39	3,904
18	77	*	185
39	187	39	570
487	1,368	2,809	5,308
*	12	23	54
1,640	2,595	1,570	13,846
494	787	194	4,367
219	258	82	1,638
678	1,417	1,291	6,459
249	131	*	1,378
-	*	*	*
10,073	10,091	5,616	69,224

SCIENTISTS AND ENGINEERS
By Field of Principal Employment

Field of Principal Employment	Administration, Management	Supervision
Architecture	605	94
Engineering - Total	9,895	4,785
Aeronautical	93	20
Ceramic	36	*
Chemical	309	271
Civil	1,457	895
Electrical - Total	1,815	743
Electronics	952	300
Power	863	443
Geological	84	66
Industrial	2,103	773
Marine	86	13
Materials	179	111
Mechanical	487	259
Metallurgical	237	158
Mining	417	209
Nuclear	15	21
Petroleum	440	262
Surveying	104	61
Textile	31	14
Transportation	194	113
Engineering n.e.s.	1,808	792
Physical Science - Total	1,703	610
Chemistry	911	324
Atm., Hydro., Litho.	346	206
Mathematics	241	39
Physics	205	41
Physical Science n.e.s.	-	-
Life Science - Total	1,779	554
Agriculture	550	138
Biology	194	67
Forestry	929	224
Veterinary	96	121
Life Science n.e.s.	10	*
Social Science - Total	2,017	427
Ec. and Stat.	1,514	166
Psychology	104	20
Sociology	55	*
Social Work	334	236
Social Science n.e.s.	10	-
Other Fields - Total	1,274	249
Not Stated	911	311
Final Total(1)	18,184	7,030

TABLE II.7

EMPLOYED IN CANADA, 1967
and Work Function

Management, Supervision of R & D	Research	Development, Product or Technical	Teaching, Extension Work
67	78	66	17
878	976	1,599	701
37	85	21	*
*	*	*	*
40	65	199	25
86	139	65	103
159	125	415	124
119	95	318	97
40	30	97	27
26	17	14	*
101	44	113	17
*	*	*	-
18	14	37	*
114	121	102	151
95	110	91	15
18	18	21	32
*	*	12	*
24	17	83	*
*	*	*	11
11	*	70	*
*	16	19	*
121	180	326	193
587	1,952	509	1,263
350	993	283	463
83	451	128	275
30	92	43	248
124	416	55	277
-	-	-	-
345	1,462	101	677
78	361	29	211
69	906	18	333
192	149	51	49
*	30	*	80
*	16	-	*
118	544	100	583
97	372	96	231
*	64	-	104
*	25	*	66
*	15	*	52
*	68	-	130
44	176	20	3,299
139	183	87	232
2,178	5,371	2,482	6,772

SCIENTISTS AND ENGINEERS
By Field of Principal Employment

Field of Principal Employment	Clinical Practice	Counselling Practice, Case Work
Architecture	-	*
Engineering - Total	*	259
Aeronautical	-	-
Ceramic	-	-
Chemical	*	*
Civil	-	86
Electrical - Total	*	27
Electronics	*	16
Power	-	11
Geological	-	*
Industrial	*	20
Marine	-	*
Materials	-	*
Mechanical	-	14
Metallurgical	*	*
Mining	-	50
Nuclear	-	-
Petroleum	-	*
Surveying	-	*
Textile	-	-
Transportation	-	*
Engineering n.e.s.	*	33
Physical Science - Total	26	34
Chemistry	16	16
Atm., Hydro., Litho.	*	10
Mathematics	-	*
Physics	*	*
Physical Science n.e.s.	-	-
Life Science - Total	513	31
Agriculture	*	10
Biology	21	*
Forestry	*	*
Veterinary	473	10
Life Science n.e.s.	14	*
Social Science - Total	24	645
Ec. and Stat.	*	86
Psychology	*	52
Sociology	-	*
Social Work	17	503
Social Science n.e.s.	-	-
Other Fields - Total	12	47
Not Stated	42	24
Final Total(1)	624	1,045

TABLE II.7 (continued)

EMPLOYED IN CANADA, 1967
and Work Function

Industrial or Management Consulting	Construction, Installation, Erection	Design	Field Exploration
10	102	778	*
631	1,418	4,241	290
*	*	29	-
-	*	*	-
14	22	185	-
26	340	1,281	36
62	171	1,066	*
29	52	442	*
33	119	624	*
*	*	*	67
155	138	221	*
*	*	44	-
*	*	49	-
72	173	439	*
14	*	11	47
106	23	37	68
-	-	65	-
17	55	102	25
*	*	10	18
*	-	*	*
*	12	28	*
142	455	661	12
60	16	94	337
10	*	34	*
25	*	*	329
22	*	*	*
*	*	46	*
-	-	-	-
32	16	15	126
*	10	*	79
*	*	*	*
26	*	*	41
*	-	-	-
-	-	-	-
112	11	*	12
101	10	*	10
*	-	-	-
*	-	-	*
*	*	-	*
-	-	-	-
24	*	55	*
40	45	139	29
909	1,616	5,327	798

SCIENTISTS AND ENGINEERS
By Field of Principal Employment

Field of Principal Employment	Production, Operation, Maintenance	Testing, Inspection, Quality Control
Architecture	25	-
Engineering - Total	1,684	774
Aeronautical	10	*
Ceramic	*	-
Chemical	112	76
Civil	46	140
Electrical - Total	342	60
Electronics	164	24
Power	178	36
Geological	70	*
Industrial	246	283
Marine	*	15
Materials	62	*
Mechanical	69	23
Metallurgical	62	30
Mining	65	19
Nuclear	19	*
Petroleum	267	12
Surveying	19	*
Textile	*	*
Transportation	35	*
Engineering n.e.s.	242	81
Physical Science - Total	228	358
Chemistry	111	285
Atm., Hydro., Litho.	53	14
Mathematics	54	-
Physics	10	59
Physical Science n.e.s.	-	-
Life Science - Total	173	322
Agriculture	120	113
Biology	13	81
Forestry	37	*
Veterinary	*	117
Life Science n.e.s.	-	*
Social Science - Total	26	22
Ec. and Stat.	26	19
Psychology	-	*
Sociology	-	-
Social Work	-	*
Social Science n.e.s.	-	-
Other Fields - Total	26	*
Not Stated	126	108
Final Total(1)	2,288	1,591

TABLE II.7 (continued)

EMPLOYED IN CANADA, 1967
and Work Function

Computer Serv. Statistical Processing	Statistical Analysis, Forecasting	Personnel Training & Development	Extension Work in Agriculture
*	-	-	*
325	156	105	27
-	-	*	*
*	-	-	-
*	*	-	-
26	22	*	10
169	24	60	*
162	13	58	*
*	11	*	-
*	*	-	-
30	29	*	*
*	*	*	-
-	-	*	-
61	*	*	-
*	-	*	-
*	11	*	-
-	*	-	-
11	27	*	-
*	-	-	-
-	-	*	-
*	*	*	-
15	27	19	13
168	168	15	12
*	7	*	*
14	136	*	*
144	23	*	-
*	*	*	*
-	-	-	-
*	15	18	461
*	10	*	415
*	-	*	38
*	*	*	-
-	-	*	*
-	-	-	-
37	201	104	49
33	194	*	37
*	*	35	*
*	*	*	*
-	-	59	*
-	-	-	-
18	10	38	12
19	15	18	34
577	565	298	597

SCIENTISTS AND ENGINEERS
By Field of Principal Employment

Field of Principal Employment	Publicity	Sales, Service, Marketing, Purchasing
Architecture	*	*
Engineering - Total	12	1,879
Aeronautical	-	20
Ceramic	-	*
Chemical	-	115
Civil	*	151
Electrical - Total	*	475
Electronics	*	241
Power	-	234
Geological	*	*
Industrial	-	112
Marine	-	*
Materials	-	42
Mechanical	*	395
Metallurgical	-	37
Mining	-	45
Nuclear	-	*
Petroleum	*	120
Surveying	-	*
Textile	-	*
Transportation	-	*
Engineering n.e.s.	*	331
Physical Science - Total	*	377
Chemistry	*	321
Atm., Hydro., Litho	-	13
Mathematics	*	18
Physics	-	25
Physical Science n.e.s.	-	-
Life Science - Total	15	177
Agriculture	13	128
Biology	-	20
Forestry	*	27
Veterinary	-	*
Life Science n.e.s.	-	-
Social Science - Total	15	500
Ec. and Stat.	*	493
Psychology	*	*
Sociology	*	*
Social Work	*	*
Social Science n.e.s.	-	-
Other Fields - Total	28	78
Not Stated	10	248
Final Total (1)	86	3,261

(1) Final total includes numbers less than 10 that were not quoted.
- Not reported
* Less than 10

EMPLOYED IN CANADA, 1967
and Work Function

Report, Technical Writing, Editing	Other	Not Stated	Final Total
12	143	192	2,201
509	1,031	1,229	33,411
*	*	10	358
*	47	*	121
18	20	67	1,548
123	200	185	5,424
92	157	215	6,313
54	97	106	3,345
38	60	109	2,968
10	*	14	401
23	95	151	4,668
*	10	*	216
23	*	25	594
29	58	81	2,658
12	10	31	971
*	49	37	1,239
*	*	*	162
23	23	52	1,570
*	37	31	540
-	-	*	162
11	*	19	505
117	295	293	6,161
105	269	373	9,269
13	65	194	4,429
79	129	107	2,415
*	38	28	1,049
*	37	44	1,376
-	-	-	-
110	345	485	7,781
16	153	199	2,654
14	41	68	1,901
79	40	131	2,018
-	108	86	1,146
*	*	*	62
90	302	214	6,158
80	228	133	3,950
*	15	18	441
*	*	11	207
*	49	49	1,337
*	*	*	223
120	287	214	6,049
118	178	1,311	4,367
1,064	2,555	4,018	69,236

SCIENTISTS AND ENGINEERS
By Field of Principal Employment and

Field of Principal Employment	Architecture	Engineering Total
Architecture	2,076	35
Engineering - Total	53	30,321
Aeronautical	-	327
Ceramic	-	112
Chemical	*	1,362
Civil	26	4,994
Electrical - Total	*	5,928
Electronics	-	3,065
Power	*	2,863
Geological	-	227
Industrial	*	4,211
Marine	-	188
Materials	-	563
Mechanical	-	2,534
Metallurgical	*	740
Mining	-	1,120
Nuclear	-	147
Petroleum	-	1,424
Surveying	*	250
Textile	-	134
Transportation	*	490
Engineering n.e.s.	16	5,570
Physical Science - Total	*	1,598
Chemistry	-	733
Atm., Hydro., Litho.	*	330
Mathematics	*	201
Physics	-	334
Physical Science n.e.s.	-	-
Life Science - Total	*	787
Agriculture	*	200
Biology	-	27
Forestry	*	558
Veterinary	*	*
Life Science n.e.s.	-	*
Social Science - Total	14	1,528
Ec. and Stat.	11	1,390
Psychology	*	104
Sociology	*	25
Social Work	-	*
Social Science n.e.s.	-	-
Other Fields - Total	105	1,449
Not Stated	128	2,124
Final Total(1)	2,382	37,842

TABLE II.8

EMPLOYED IN CANADA, 1967
Field of Study for Highest Degree

Field of Study for Highest Degree			
Aeronautical	Ceramic	Chemical	Civil
-	-	-	22
245	126	2,733	8,566
114	*	*	34
-	85	*	*
*	*	749	97
*	*	88	4,277
11	*	114	533
*	*	46	216
*	*	68	317
-	-	-	23
27	*	537	902
*	*	*	29
*	*	35	80
25	*	168	112
-	*	71	12
-	-	*	30
*	-	18	*
*	*	350	148
-	-	*	147
-	-	41	*
*	-	*	343
48	*	535	1,788
*	12	638	100
*	*	553	23
-	-	*	45
*	*	18	26
*	*	60	*
-	-	-	-
-	*	27	92
-	-	*	72
-	*	*	*
-	-	18	17
-	-	*	-
-	-	-	-
*	*	209	332
*	*	200	308
*	-	*	17
-	-	-	*
-	-	-	*
-	-	-	-
20	*	241	220
122	*	291	410
401	144	4,139	9,742

SCIENTISTS AND ENGINEERS
By Field of Principal Employment and

Field of Principal Employment	Electrical	Engineering Science
Architecture	*	-
Engineering - Total	6,717	490
Aeronautical	37	10
Ceramic	*	-
Chemical	42	*
Civil	74	*
Electrical - Total	4,257	247
Electronics	2,264	208
Power	1,993	39
Geological	14	12
Industrial	883	42
Marine	11	*
Materials	12	*
Mechanical	312	46
Metallurgical	*	*
Mining	*	*
Nuclear	17	*
Petroleum	111	11
Surveying	*	*
Textile	*	-
Transportation	50	-
Engineering n.e.s.	869	79
Physical Science - Total	267	101
Chemistry	18	12
Atm., Hydro., Litho.	20	13
Mathematics	73	30
Physics	156	46
Physical Science n.e.s.	-	-
Life Science - Total	*	*
Agriculture	*	-
Biology	-	*
Forestry	*	*
Veterinary	-	-
Life Science n.e.s.	-	-
Social Science - Total	334	18
Ec. and Stat.	295	14
Psychology	30	*
Sociology	*	*
Social Work	*	-
Social Science n.e.s.	-	-
Other Fields	411	121
Not Stated	398	34
Final Total(1)	8,138	767

TABLE II.8 (continued)

EMPLOYED IN CANADA, 1967
Field of Study for Highest Degree

Field of Study for Highest Degree			
Geological	Industrial	Marine	Materials
-	-	*	-
275	312	71	43
*	*	*	-
-	*	-	-
*	11	-	-
*	16	*	*
12	37	*	*
*	28	*	*
*	*	*	*
126	*	-	-
13	169	13	*
-	*	34	*
*	*	*	19
*	12	*	*
*	-	-	-
69	*	*	-
-	-	*	-
23	*	*	-
*	-	-	-
-	*	-	-
*	*	-	-
14	46	*	*
188	16	*	-
*	*	-	-
183	-	-	-
*	10	-	-
-	*	*	-
-	-	-	-
-	*	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	*	-	-
62	55	-	-
59	45	-	-
*	*	-	-
*	*	-	-
-	*	-	-
-	-	-	-
24	22	*	*
25	30	*	*
574	436	84	47

SCIENTISTS AND ENGINEERS
By Field of Principal Employment and

Field of Principal Employment	Mechanical	Metallurgical
Architecture	*	*
Engineering - Total	6,733	791
Aeronautical	111	-
Ceramic	*	*
Chemical	385	31
Civil	230	12
Electrical - Total	570	12
Electronics	230	*
Power	340	*
Geological	*	*
Industrial	1,161	71
Marine	85	*
Materials	364	21
Mechanical	1,739	20
Metallurgical	50	497
Mining	36	20
Nuclear	85	*
Petroleum	255	*
Surveying	*	*
Textile	75	-
Transportation	54	-
Engineering n.e.s.	1,519	90
Physical Science - Total	121	38
Chemistry	60	17
Atm., Hydro., Litho.	10	*
Mathematics	25	*
Physics	26	19
Physical Science n.e.s.	-	-
Life Science - Total	36	*
Agriculture	*	*
Biology	*	*
Forestry	20	*
Veterinary	-	-
Life Science n.e.s.	-	-
Social Science - Total	302	42
Ec. and Stat.	287	37
Psychology	10	*
Sociology	*	*
Social Work	*	-
Social Science n.e.s.	-	-
Other Fields - Total	226	27
Not Stated	500	42
Final Total(1)	7,920	944

TABLE II.8 (continued)

EMPLOYED IN CANADA, 1967
Field of Study for Highest Degree

Field of Study for Highest Degree			
Mining	Nuclear	Petroleum	Surveying
-	-	-	*
1,732	24	449	58
-	*	-	-
*	-	-	-
10	-	*	-
44	-	*	10
58	*	*	*
*	*	*	*
50	-	-	-
35	-	*	*
290	*	13	*
*	*	-	-
*	-	*	-
34	*	*	-
86	-	-	-
906	11	*	-
*	*	-	-
87	-	404	*
11	-	*	35
-	-	*	-
*	-	-	-
151	*	11	*
45	*	*	*
*	*	*	-
32	-	-	*
*	-	-	*
*	*	-	-
-	-	-	-
*	-	-	56
-	-	-	-
-	-	-	-
*	-	-	56
-	-	-	-
-	-	-	-
75	-	*	*
61	-	*	*
13	-	*	*
*	-	-	-
-	-	-	*
-	-	-	-
42	*	*	*
129	*	17	*
2,024	31	479	132

SCIENTISTS AND ENGINEERS
By Field of Principal Employment and

Field of Principal Employment	Textile	Transportation
Architecture	-	-
Engineering - Total	11	35
Aeronautical	-	-
Ceramic	-	-
Chemical	-	-
Civil	*	*
Electrical - Total	-	-
Electronics	-	-
Power	-	-
Geological	-	-
Industrial	-	*
Marine	-	-
Materials	-	-
Mechanical	-	-
Metallurgical	-	-
Mining	-	-
Nuclear	*	-
Petroleum	-	-
Surveying	*	-
Textile	*	*
Transportation	-	21
Engineering n.e.s.	*	*
Physical Science - Total	*	*
Chemistry	*	*
Atm., Hydro., Litho.	-	-
Mathematics	-	-
Physics	-	-
Physical Science n.e.s.	-	-
Life Science - Total	-	-
Agriculture	-	-
Biology	-	-
Forestry	-	-
Veterinary	-	-
Life Science n.e.s.	-	-
Social Science - Total	*	*
Ec. and Stat.	*	*
Psychology	-	-
Sociology	-	-
Social Work	-	-
Social Science n.e.s.	-	-
Other Fields - Total	*	-
Not Stated	*	*
Final Total[(1)]	17	39

TABLE II.8 (continued)

EMPLOYED IN CANADA, 1967
Field of Study for Highest Degree

Field of Study for Highest Degree			
Engineering n.e.s.	Physical Science Total	Chemistry	Atm., Hydro., Litho.
*	*	*	*
910	1,563	484	375
*	15	*	*
*	*	*	-
19	116	102	*
193	102	36	41
60	202	18	12
37	170	13	*
23	32	*	*
*	154	*	143
70	215	63	14
*	*	-	-
*	18	10	-
45	50	16	*
*	189	56	*
26	59	*	52
*	13	*	-
16	104	86	13
34	62	*	61
*	19	16	*
11	*	*	-
394	232	62	28
51	6,389	2,856	1,709
22	2,876	2,752	29
15	1,869	41	1,586
*	703	14	37
*	941	49	57
-	-	-	-
561	221	121	77
113	30	20	*
*	154	85	61
440	19	*	*
-	*	-	*
-	15	10	-
77	526	155	158
66	341	130	96
*	164	23	57
*	14	*	*
-	*	-	*
-	*	-	*
77	1,744	650	262
105	560	231	130
1,784	11,008	4,498	2,713

SCIENTISTS AND ENGINEERS
By Field of Principal Employment and

Field of Principal Employment	Mathematics	Physics
Architecture	*	*
Engineering - Total	215	287
Aeronautical	*	*
Ceramic	-	-
Chemical	*	*
Civil	10	14
Electrical - Total	84	86
Electronics	75	72
Power	*	14
Geological	*	*
Industrial	54	24
Marine	*	*
Materials	*	*
Mechanical	10	18
Metallurgical	*	*
Mining	*	*
Nuclear	*	*
Petroleum	*	*
Surveying	-	-
Textile	*	-
Transportation	*	*
Engineering n.e.s.	38	98
Physical Science - Total	687	1,130
Chemistry	11	84
Atm., Hydro., Litho.	74	168
Mathematics	581	71
Physics	21	807
Physical Science n.e.s.	-	-
Life Science - Total	*	12
Agriculture	*	*
Biology	*	*
Forestry	*	*
Veterinary	*	-
Life Science n.e.s.	*	*
Social Science - Total	169	41
Ec. and Stat.	81	31
Psychology	78	*
Sociology	*	*
Social Work	*	*
Social Science n.e.s.	-	*
Other Fields - Total	450	379
Not Stated	89	106
Final Total(1)	1,620	1,956

TABLE II.8 (continued)

EMPLOYED IN CANADA, 1967
Field of Study for Highest Degree

Field of Study for Highest Degree			
Physical Science n.e.s.	Life Science Total	Agriculture	Biology
-	26	24	-
202	169	87	25
-	*	-	*
-	-	-	-
*	11	*	*
*	26	15	*
*	14	*	-
*	11	*	-
-	*	*	-
-	-	-	-
60	43	19	10
-	*	-	*
*	*	*	-
*	*	*	-
124	*	*	*
-	-	-	-
-	-	-	-
-	*	-	-
-	*	*	-
-	*	*	-
-	*	-	-
*	52	32	*
*	615	417	175
-	494	386	99
-	28	14	*
-	71	*	60
*	22	12	*
-	-	-	-
*	6,396	2,305	1,718
-	2,316	2,098	204
-	1,578	157	1,379
*	1,402	27	111
-	1,071	14	11
*	29	*	13
*	728	550	89
*	643	491	79
-	39	27	*
-	30	19	*
-	16	13	*
-	-	-	-
*	1,141	690	369
*	672	403	121
221	9,747	4,476	2,497

SCIENTISTS AND ENGINEERS
By Field of Principal Employment and

Field of Principal Employment	Forestry	Veterinary
Architecture	-	*
Engineering - Total	56	*
Aeronautical	-	-
Ceramic	-	-
Chemical	*	-
Civil	*	-
Electrical - Total	*	*
Electronics	*	*
Power	*	-
Geological	-	-
Industrial	14	-
Marine	*	-
Materials	-	-
Mechanical	*	-
Metallurgical	*	-
Mining	-	-
Nuclear	-	-
Petroleum	*	-
Surveying	*	-
Textile	*	-
Transportation	*	-
Engineering n.e.s.	18	-
Physical Science - Total	18	*
Chemistry	*	*
Atm., Hydro., Litho.	*	-
Mathematics	*	-
Physics	-	*
Physical Science n.e.s.	-	-
Life Science - Total	1,291	1,075
Agriculture	*	*
Biology	27	15
Forestry	1,257	*
Veterinary	-	1,045
Life Science n.e.s.	-	*
Social Science - Total	82	*
Ec. and Stat.	72	*
Psychology	*	-
Sociology	*	*
Social Work	*	-
Social Science n.e.s.	-	-
Other Fields - Total	73	*
Not Stated	65	80
Final Total(1)	1,585	1,176

TABLE II.8 (continued)

EMPLOYED IN CANADA, 1967
Field of Study for Highest Degree

Field of Study for Highest Degree			
Life Science n.e.s.	Social Science Total	Ec. & Stat.	Psychology
-	*	*	*
-	219	157	51
-	*	*	-
-	-	-	-
-	*	*	-
-	13	*	*
-	48	46	-
-	28	26	-
-	20	20	-
-	*	*	-
-	93	44	47
-	*	*	-
-	*	*	-
-	11	10	*
-	*	*	-
-	*	*	-
-	-	-	-
-	*	*	-
-	*	-	-
-	-	-	-
-	-	-	-
-	29	25	*
*	50	44	*
-	17	14	*
-	*	*	-
-	25	25	-
*	-	-	-
-	-	-	-
*	28	20	*
-	13	*	*
-	*	*	*
-	*	*	-
*	-	-	-
*	*	*	-
-	2,762	1,213	85
-	1,232	1,113	28
-	69	15	40
-	98	26	*
-	1,156	*	11
-	207	56	-
*	285	143	16
*	241	131	13
13	3,589	1,709	171

SCIENTISTS AND ENGINEERS
By Field of Principal Employment and

Field of Principal Employment	Sociology	Social Work
Architecture	-	-
Engineering - Total	*	*
Aeronautical	-	-
Ceramic	-	-
Chemical	-	-
Civil	*	-
Electrical - Total	-	-
Electronics	-	-
Power	-	-
Geological	-	-
Industrial	*	*
Marine	-	-
Materials	-	-
Mechanical	-	-
Metallurgical	-	-
Mining	-	-
Nuclear	-	-
Petroleum	-	-
Surveying	*	-
Textile	-	-
Transportation	-	-
Engineering n.e.s.	*	-
Physical Science - Total	*	-
Chemistry	*	-
Atm., Hydro., Litho.	*	-
Mathematics	-	-
Physics	-	-
Physical Science n.e.s.	-	-
Life Science - Total	*	*
Agriculture	*	-
Biology	*	-
Forestry	-	-
Veterinary	-	-
Life Science n.e.s.	-	*
Social Science - Total	80	1,144
Ec. and Stat.	10	11
Psychology	*	*
Sociology	53	10
Social Work	10	1,117
Social Science n.e.s.	*	-
Other Fields - Total	15	78
Not Stated	10	69
Final Total(1)	116	1,293

(1) Final total includes numbers less than 10 that were not quoted.
- Not reported
* Less than 10

EMPLOYED IN CANADA, 1967
Field of Study for Highest Degree

Field of Study for Highest Degree			
Social Science n.e.s.	Other Fields Total	Not Stated	Final Total
*	18	34	2,198
*	346	715	33,386
-	*	*	358
-	-	*	120
-	16	34	1,546
*	115	150	5,426
*	36	87	6,316
*	21	51	3,346
-	15	36	2,970
-	*	14	400
-	30	68	4,666
-	*	16	216
-	*	*	593
-	18	40	2,656
-	*	28	972
-	11	47	1,239
-	-	*	162
-	14	19	1,569
-	*	16	340
-	*	*	162
-	*	*	504
*	76	166	6,141
*	238	374	9,266
*	152	155	4,427
*	41	139	2,416
-	22	26	1,049
-	23	54	1,374
-	-	-	-
-	128	216	7,780
-	30	64	2,654
-	63	71	1,901
-	11	21	2,017
-	11	58	1,146
-	13	*	62
240	324	277	6,159
70	188	146	3,951
*	51	13	441
*	16	22	207
15	64	87	1,337
150	*	*	223
33	1,026	301	6,051
18	209	429	4,363
300	2,289	2,346	69,203

SCIENTISTS AND ENGINEERS
By Location of Secondary School Graduation

Location of Secondary School Graduation	Newfoundland	Prince Edward Island
North America	454	178
Canada - Total	448	178
Newfoundland	257	*
Prince Edward Island	*	93
Nova Scotia	34	19
New Brunswick	22	14
Quebec	13	*
Ontario	47	11
Manitoba	*	*
Saskatchewan	10	*
Alberta	*	14
British Columbia	*	*
Yukon & N. W. T.	14	-
Canada, Unspecified	25	*
United States	*	-
North America, Other	-	-
Caribbean	*	-
Central America	-	-
South America	-	-
Europe - Total	51	*
United Kingdom	36	*
France	*	-
Germany (Republic of West)	*	*
Irish Republic	*	-
Italy	-	-
Netherlands	*	-
Norway	-	-
Poland	-	-
Sweden	-	-
U. S. S. R.	*	-
Europe, Other	*	*
Oceania - Total	-	-
Australia	-	-
Oceania, Other	-	-
Asia - Total	*	*
Hong Kong	*	*
India	*	*
Asia, Other	-	*
Africa - Total	*	-
Other, Unspecified	*	-
Not Stated	*	*
Final Total(1)	524	190

TABLE II.9

EMPLOYED IN CANADA, 1967
and Province and Region of Employment

Nova Scotia	New Brunswick	Atlantic Total	Quebec
1,793	1,187	3,612	14,035
1,777	1,174	3,577	13,837
38	10	307	33
50	43	188	30
1,110	101	1,264	381
149	626	811	312
55	99	172	9,662
201	183	442	2,107
64	30	105	355
27	31	76	247
27	12	62	192
35	*	54	337
-	-	14	*
21	30	82	176
15	13	34	196
*	-	*	*
*	*	*	41
-	-	-	*
*	-	*	12
127	65	248	1,545
71	37	147	524
*	*	*	52
*	*	15	75
*	-	*	*
*	-	*	65
*	*	17	54
*	*	*	11
*	*	*	250
*	-	*	*
*	*	*	123
28	*	42	377
*	*	*	15
*	-	*	10
-	*	*	*
16	*	35	120
*	*	10	13
*	*	17	47
*	*	*	60
*	*	13	44
*	*	*	122
*	*	22	111
1,957	1,277	3,948	16,046

SCIENTISTS AND ENGINEERS
By Location of Secondary School Graduation

Location of Secondary School Graduation	Ontario	Manitoba
North America	26,639	2,430
Canada - Total	26,201	2,413
Newfoundland	84	*
Prince Edward Island	177	*
Nova Scotia	752	26
New Brunswick	710	11
Quebec	1,362	50
Ontario	18,129	391
Manitoba	1,306	1,438
Saskatchewan	1,560	307
Alberta	923	97
British Columbia	918	58
Yukon & N. W. T.	*	-
Canada, Unspecified	277	30
United States	433	17
North America, Other	*	-
Caribbean	63	*
Central America	-	-
South America	15	-
Europe - Total	3,632	200
United Kingdom	2,010	111
France	*	*
Germany (Republic of West)	243	16
Irish Republic	26	*
Italy	14	*
Netherlands	224	18
Norway	23	*
Poland	215	*
Sweden	32	-
U. S. S. R.	200	20
Europe, Other	636	19
Oceania - Total	118	*
Australia	93	*
Oceania, Other	25	*
Asia - Total	426	19
Hong Kong	103	*
India	191	*
Asia, Other	132	*
Africa - Total	69	*
Other, Unspecified	125	*
Not Stated	257	23
Final Total(1)	31,344	2,691

TABLE II.9 (continued)

EMPLOYED IN CANADA, 1967
and Province and Region of Employment

Saskatchewan	Alberta	Prairie Total	British Columbia
2,250	5,110	9,790	5,822
2,223	4,865	9,501	5,708
*	*	11	10
*	*	*	*
12	65	103	42
10	62	83	35
20	82	152	87
126	458	975	484
133	353	1,924	361
1,688	701	2,696	386
151	2,740	2,988	474
50	325	433	3,722
*	*	*	*
24	68	122	99
27	245	289	114
-	-	-	-
*	10	19	13
-	-	-	-
-	*	*	*
182	410	792	898
103	187	401	586
*	*	*	*
*	29	54	44
-	*	*	*
*	*	*	*
13	69	100	60
-	*	*	12
*	31	42	18
-	*	*	-
10	17	47	24
42	63	124	141
*	*	14	31
*	*	*	17
*	*	*	14
21	51	91	59
*	20	25	*
12	13	32	21
*	18	34	29
*	10	22	15
*	11	26	21
21	24	68	59
2,499	5,633	10,823	6,924

APPENDIX TABLE II.9 (continued)

Location of Secondary School Graduation	Yukon and N. W. T.	Final Total
North America	122	60,020
Canada - Total	121	58,945
Newfoundland	-	445
Prince Edward Island	*	410
Nova Scotia	*	2,547
New Brunswick	*	1,953
Quebec	*	11,439
Ontario	65	22,202
Manitoba	*	4,058
Saskatchewan	13	4,978
Alberta	13	4,652
British Columbia	10	5,474
Yukon & N. W. T.	*	31
Canada, Unspecified	-	756
United States	*	1,067
North America, Other	-	*
Caribbean	*	141
Central America	-	*
South America	-	35
Europe - Total	*	7,124
United Kingdom	*	3,673
France	-	76
Germany (Republic of West)	-	431
Irish Republic	-	49
Italy	-	86
Netherlands	*	456
Norway	-	55
Poland	-	532
Sweden	*	42
U. S. S. R.	-	402
Europe, Other	*	1,322
Oceania - Total	-	184
Australia	-	128
Oceania, Other	-	56
Asia - Total	*	732
Hong Kong	-	160
India	-	308
Asia, Other	*	264
Africa - Total	-	163
Other, Unspecified	*	302
Not Stated	-	517
Final Total[1]	134	69,219

(1) Final Total includes numbers less than 10 that were not quoted.
* Less than 10
\- Not Reported

SCIENTISTS AND ENGINEERS
By Field of Principal Employment,

Field of Principal Employment	Working For an Employer		
	Number	Median	Mean
Architecture	863	$10,800	$10,859
Engineering - Total	28,908	11,248	12,148
Aeronautical	316	10,980	11,713
Ceramic	114	10,000	12,342
Chemical	1,354	10,900	11,978
Civil	4,585	10,600	11,312
Electrical - Total	5,757	11,400	11,981
Electronics	3,065	10,800	11,462
Power	2,692	12,000	12,572
Geological	312	11,280	12,020
Industrial	4,217	12,000	12,882
Marine	194	10,500	10,996
Materials	476	11,000	11,754
Mechanical	2,185	10,800	11,450
Metallurgical	847	12,300	13,683
Mining	984	12,000	13,737
Nuclear	161	10,650	11,490
Petroleum	1,398	12,000	13,204
Surveying	222	9,579	10,352
Textile	144	9,800	11,638
Transportation	425	12,100	12,860
Engineering n.e.s.	5,217	11,400	12,140
Physical Science - Total	8,248	11,000	11,991
Chemistry	4,019	11,000	11,850
Atm., Hydro., Litho.	2,094	11,100	11,895
Mathematics	973	10,500	12,430
Physics	1,162	11,800	12,285
Physical Science n.e.s.	-	-	-
Life Science - Total	6,306	10,000	10,714
Agriculture	2,096	9,450	9,837
Biology	1,705	10,500	11,048
Forestry	1,876	10,000	11,439
Veterinary	579	10,700	10,600
Life Science n.e.s.	50	10,104	10,212
Social Science - Total	5,315	10,800	12,132
Ec. and Stat.	3,268	12,000	13,633
Psychology	390	10,400	10,937
Sociology	196	11,600	11,545
Social Work	1,244	8,397	8,639
Social Science n.e.s.	217	11,000	12,229
Other Fields - Total	5,483	9,700	10,454
Not Stated	2,834	10,500	11,665
Final Total (1)	57,957	10,950	11,765

(1) Final total includes numbers less than 10 that were not quoted.
\- Not reported
* Less than 10

TABLE II.10

EMPLOYED IN CANADA, 1967
Labour Force Status and Median and Mean Earnings

Self-Employed			All Employed		
Number	Median	Mean	Number	Median	Mean
806	$15,000	$17,817	1,669	$12,000	$14,219
1,946	15,000	17,298	30,854	11,500	12,472
*	*	*	318	11,000	11,743
*	*	*	116	10,000	12,345
91	14,000	14,686	1,445	11,000	12,147
519	18,000	19,447	5,104	11,000	12,139
174	16,000	16,642	5,931	11,500	12,117
106	20,000	18,063	3,171	11,000	11,682
68	13,200	14,425	2,760	12,000	12,617
42	12,000	14,632	354	11,940	12,328
142	16,800	19,709	4,359	12,000	13,105
10	18,000	16,974	204	10,600	11,282
36	12,000	14,014	512	11,520	11,912
249	12,000	15,224	2,434	11,000	11,836
67	8,400	10,795	914	12,000	13,473
82	30,000	23,527	1,066	12,000	14,493
-	-	-	161	10,650	11,490
84	20,000	19,929	1,482	12,200	13,587
67	10,000	12,664	289	9,678	10,887
*	*	*	146	9,800	11,744
61	12,000	12,727	486	12,000	12,843
316	14,500	17,082	5,533	11,600	12,422
279	14,400	16,091	8,527	11,000	12,125
123	11,000	13,472	4,142	11,000	11,898
118	18,000	18,648	2,212	11,227	12,255
*	*	*	981	10,600	12,478
30	16,000	16,145	1,192	12,000	12,382
-	-	-	-	-	-
665	10,000	12,921	6,971	10,000	10,925
235	10,000	10,512	2,331	9,480	9,905
19	10,000	13,800	1,724	10,500	11,079
53	13,000	14,226	1,929	10,000	11,516
356	12,000	14,132	935	10,712	11,945
*	*	*	52	10,150	11,235
312	13,000	14,625	5,627	10,900	12,270
297	13,900	14,790	3,565	12,000	13,729
*	*	*	398	10,400	10,985
*	*	*	199	11,600	11,534
*	*	*	1,248	8,397	8,637
-	-	-	217	11,000	12,229
150	20,000	16,939	5,633	9,754	10,626
382	15,000	16,487	3,216	10,800	12,238
4,540	14,500	16,411	62,497	11,000	12,102

SCIENTISTS AND ENGINEERS WORKING
By Field of Employment, Median and Mean Earnings,

Field of Principal Employment	Atlantic Region		
	Number	Median	Mean
Architecture	27	$ 9,000	$10,171
Engineering - Total	1,673	10,400	10,994
Aeronautical	30	10,716	11,061
Ceramic	*	*	*
Chemical	30	10,815	12,806
Civil	360	10,000	10,230
Electrical - Total	326	10,000	10,904
Electronics	160	9,180	10,006
Power	166	11,000	11,767
Geological	15	13,800	13,381
Industrial	234	10,800	11,109
Marine	48	10,074	10,204
Materials	12	11,000	11,809
Mechanical	66	11,000	11,027
Metallurgical	60	13,963	12,691
Mining	79	10,000	12,163
Nuclear	*	*	*
Petroleum	25	12,000	12,219
Surveying	18	8,000	8,340
Textile	*	*	*
Transportation	25	11,280	10,951
Engineering n.e.s.	340	10,006	11,087
Physical Science - Total	423	10,000	10,453
Chemistry	140	10,500	11,021
Atm., Hydro., Litho.	149	9,800	9,979
Mathematics	30	9,000	9,677
Physics	104	10,300	10,595
Physical Science n.e.s.	-	-	-
Life Science - Total	470	9,400	9,853
Agriculture	114	8,793	9,432
Biology	170	9,840	9,863
Forestry	156	9,372	10,135
Veterinary	29	9,491	9,915
Life Science n.e.s.	*	*	*
Social Science - Total	275	9,000	9,650
Ec. and Stat.	144	10,500	11,073
Psychology	12	6,697	7,682
Sociology	21	10,300	9,461
Social Work	91	7,100	7,599
Social Science n.e.s.	*	*	*
Other Fields - Total	373	9,100	9,758
Not Stated	173	9,000	9,917
Final Total(1)	3,414	10,000	10,466

TABLE II.11

FOR EMPLOYERS IN CANADA, 1967
by Province and Region of Employment

Quebec			Ontario		
Number	Median	Mean	Number	Median	Mean
189	$11,000	$11,141	347	$10,800	$11,268
7,394	12,000	12,520	13,166	11,300	12,211
75	12,500	13,038	181	10,850	11,292
11	10,800	14,380	89	10,000	11,942
394	11,500	12,673	631	10,800	11,740
1,064	12,000	12,171	1,830	11,000	11,253
1,439	12,000	12,790	2,828	11,000	11,839
934	12,000	12,512	1,524	10,500	11,232
505	12,660	13,303	1,304	12,000	12,549
38	11,500	11,687	69	12,000	13,145
1,464	11,600	12,615	1,874	12,000	13,146
24	10,500	11,691	73	11,640	12,414
90	12,348	12,626	245	11,520	12,265
562	10,020	11,390	1,138	11,400	11,833
186	12,000	12,931	439	12,600	14,329
234	10,920	12,520	416	12,600	14,508
*	*	*	149	10,600	11,381
144	10,000	11,547	361	14,100	13,914
63	9,800	10,227	89	10,000	10,923
29	13,000	15,740	111	9,800	10,632
174	15,000	14,195	129	11,780	12,151
1,400	12,000	12,685	2,514	11,500	12,132
1,823	11,100	12,641	3,988	11,000	12,009
1,104	11,000	12,154	2,123	11,000	11,939
257	9,700	10,935	718	11,500	12,175
257	15,000	16,240	502	10,000	11,382
205	12,600	12,890	645	12,000	12,543
-	-	-	-	-	-
1,389	9,820	10,260	2,144	10,400	10,926
396	9,675	9,785	594	9,600	10,085
318	9,500	10,173	726	11,000	11,643
473	9,820	10,444	591	10,500	10,980
195	10,712	10,981	206	10,700	10,568
*	*	*	27	10,800	11,692
827	12,000	13,512	2,816	11,700	12,719
590	12,000	14,410	1,884	12,900	13,972
49	12,420	13,164	235	10,400	10,972
24	11,025	11,256	101	13,000	12,370
98	7,500	8,297	501	8,900	9,155
66	15,200	14,312	95	9,100	11,369
950	8,400	9,949	2,920	10,000	10,869
710	11,000	12,015	1,256	10,800	12,168
13,282	11,000	12,132	26,637	11,000	11,970

SCIENTISTS AND ENGINEERS WORKING
By Field of Employment, Median and Mean Earnings,

Field of Principal Employment	Prairie Region		
	Number	Median	Mean
Architecture	130	$12,000	$11,854
Engineering - Total	3,911	10,860	11,766
Aeronautical	20	10,300	11,267
Ceramic	*	*	*
Chemical	145	10,000	10,540
Civil	775	9,900	10,480
Electrical - Total	596	11,100	11,354
Electronics	303	10,500	10,778
Power	293	11,880	11,951
Geological	152	10,600	11,586
Industrial	361	12,250	13,718
Marine	*	*	*
Materials	30	10,020	10,491
Mechanical	240	10,000	10,260
Metallurgical	84	11,800	12,752
Mining	101	13,200	13,642
Nuclear	*	*	*
Petroleum	797	12,000	13,230
Surveying	27	9,500	10,726
Textile	*	*	*
Transportation	70	12,000	11,570
Engineering n.e.s.	494	10,450	11,275
Physical Science - Total	1,410	11,000	11,707
Chemistry	430	10,000	10,918
Atm., Hydro., Litho.	742	11,500	12,528
Mathematics	120	9,500	9,779
Physics	118	11,100	11,370
Physical Science n.e.s.	-	-	-
Life Science - Total	1,366	9,900	10,178
Agriculture	796	9,420	9,801
Biology	303	10,500	11,181
Forestry	136	9,900	10,212
Veterinary	117	10,712	10,343
Life Science n.e.s.	14	6,240	8,248
Social Science - Total	841	9,354	10,459
Ec. and Stat.	393	10,700	11,918
Psychology	68	8,800	9,809
Sociology	31	9,900	10,241
Social Work	303	8,580	8,625
Social Science n.e.s.	46	11,000	11,214
Other Fields - Total	660	9,600	10,015
Not Stated	474	9,300	10,565
Final Total(1)	8,792	10,368	11,190

(1) Final total includes numbers less than 10 that were not quoted.
(2) Number reporting includes Yukon and North West Territories.
\- Not reported
* Less than 10

FOR EMPLOYERS IN CANADA, 1967
by Province and Region of Employment

British Columbia			Total		
Number	Median	Mean	Number(2)	Median	Mean
170	$ 9,000	$ 9,059	863	$10,800	$10,859
2,679	11,000	12,056	28,904	11,248	12,145
10	11,640	12,197	316	10,980	11,713
*	*	*	114	10,000	12,342
149	10,800	11,995	1,349	10,815	11,935
527	10,000	11,715	4,584	10,600	11,312
562	11,700	11,894	5,756	11,400	11,980
143	9,500	10,122	3,065	10,800	11,461
419	12,000	12,499	2,691	12,000	12,572
37	11,000	11,383	314	11,280	12,011
281	11,600	12,914	4,217	12,000	12,881
48	8,500	9,450	195	10,500	11,015
99	9,200	10,075	476	11,000	11,754
180	9,600	10,940	2,186	10,800	11,448
76	12,000	13,614	846	12,270	13,683
119	13,200	14,872	984	12,000	13,730
-	-	-	160	10,650	11,466
71	11,500	13,085	1,398	12,000	13,208
24	8,800	9,694	222	9,579	10,352
-	-	-	144	9,800	11,638
27	11,400	12,778	425	12,100	12,860
465	11,500	12,223	5,218	11,400	12,140
592	11,000	11,653	8,254	11,000	11,989
227	10,400	11,754	4,024	11,000	11,847
212	10,500	11,310	2,095	11,100	11,892
63	11,000	11,634	973	10,500	12,430
90	11,700	12,217	1,162	11,800	12,285
-	-	-	-	-	-
917	9,991	12,131	6,296	10,000	10,710
194	8,640	9,554	2,096	9,450	9,837
184	10,300	11,113	1,704	10,500	11,049
509	10,000	13,599	1,868	10,000	11,429
29	10,700	10,164	578	10,700	10,600
*	*	*	50	10,104	10,212
550	9,360	10,866	5,318	10,800	12,130
257	12,000	13,421	3,271	12,000	13,629
26	10,740	10,880	390	10,400	10,937
19	11,600	11,931	196	11,600	11,545
245	7,800	8,087	1,244	8,397	8,640
*	*	*	217	11,000	12,229
575	9,754	10,126	5,482	9,700	10,454
218	10,560	11,408	2,833	10,500	11,666
5,701	10,380	11,602	57,950	10,944	11,763

SCIENTISTS AND ENGINEERS WORKING
By Field of Principal Employment, Level of

Broad Field of Principal Employment, Level of Education		20 - 24	
	Number	Median	Mean
Architecture - Total	49	$7,200	$7,200
Professional Certification	-	-	-
Bachelor Pass or 1st Prof. Degree	49	7,200	7,200
Bachelor Honours	-	-	-
Masters	-	-	-
Doctorate	-	-	-
Not Stated	-	-	-
Engineering - Total	813	6,960	7,002
Professional Certification	17	6,000	5,971
Bachelor Pass or 1st Prof. Degree	556	6,960	6,997
Bachelor Honours	220	6,960	7,062
Masters	18	7,200	7,468
Doctorate	-	-	-
Not Stated	*	*	*
Physical Science - Total	261	6,900	6,895
Professional Certification	*	*	*
Bachelor Pass or 1st Prof. Degree	90	6,800	6,686
Bachelor Honours	143	7,200	7,061
Masters	19	7,300	7,313
Doctorate	-	-	-
Not Stated	*	*	*
Life Science - Total	117	6,300	6,173
Professional Certification	*	*	*
Bachelor Pass or 1st Prof. Degree	68	6,300	6,436
Bachelor Honours	43	6,240	5,823
Masters	*	*	*
Doctorate	-	-	-
Not Stated	*	*	*
Social Science - Total	132	7,140	6,898
Professional Certification	*	*	*
Bachelor Pass or 1st Prof. Degree	61	7,200	6,781
Bachelor Honours	18	6,420	6,765
Masters	52	7,140	7,101
Doctorate	-	-	-
Not Stated	-	-	-
Other Fields - Total	295	6,700	6,646
Field Not Stated	94	6,540	6,721
Final Total(1)	1,761	6,900	6,854

TABLE II.12

FOR EMPLOYERS IN CANADA, 1967
Education, Age Group and Median and Mean Earnings

Age Group					
25 - 29			30 - 34		
Number	Median	Mean	Number	Median	Mean
141	$7,258	$7,572	158	$ 9,000	$ 9,482
*	*	*	28	9,750	9,537
99	7,700	7,836	107	8,400	9,080
28	6,600	6,609	14	10,000	10,748
*	*	*	*	*	*
-	-	-	-	-	-
-	-	-	-	-	-
4,200	8,100	8,342	4,557	10,000	10,356
51	7,500	8,003	139	12,000	11,320
3,072	8,000	8,277	3,376	10,000	10,188
555	8,200	8,498	421	10,500	10,778
458	8,400	8,465	507	10,800	10,718
53	10,000	9,850	109	10,600	11,076
11	7,848	7,909	*	*	*
1,020	8,000	8,185	1,327	9,900	10,103
18	6,800	7,354	30	8,012	8,171
389	8,100	8,340	474	9,500	10,155
226	7,550	7,923	177	9,500	9,655
255	7,700	7,710	217	9,475	9,649
127	9,500	9,313	424	10,400	10,634
*	*	*	*	*	*
741	7,250	7,590	671	8,600	8,861
*	*	*	*	*	*
484	7,250	7,596	312	8,150	8,429
118	7,170	6,961	94	8,500	8,406
93	7,565	7,443	109	8,600	8,689
43	9,192	9,494	147	10,000	10,201
-	-	-	*	*	*
700	8,000	8,506	693	10,000	10,561
27	6,600	6,600	*	*	*
203	7,860	8,998	249	10,125	10,845
76	7,600	8,433	74	10,600	11,286
329	7,800	8,205	301	9,403	10,061
64	9,100	9,413	61	11,000	11,105
*	*	*	-	-	-
941	7,300	7,664	1,022	9,000	8,946
407	7,800	8,048	294	9,100	9,622
8,150	7,920	8,162	8,722	9,754	10,013

SCIENTISTS AND ENGINEERS WORKING
By Field of Principal Employment, Level of

Broad Field of Principal Employment, Level of Education	35 - 39		
	Number	Median	Mean
Architecture - Total	151	$11,000	$11,690
Professional Certification	14	11,100	11,228
Bachelor Pass or 1st Prof. Degree	126	11,000	11,825
Bachelor Honours	*	*	*
Masters	*	*	*
Doctorate	-	-	-
Not Stated	-	-	-
Engineering - Total	4,328	11,680	12,028
Professional Certification	196	11,000	11,149
Bachelor Pass or 1st Prof. Degree	3,019	11,500	11,931
Bachelor Honours	597	12,000	12,425
Masters	405	11,600	12,237
Doctorate	103	13,000	13,486
Not Stated	*	*	*
Physical Science - Total	1,642	11,000	11,479
Professional Certification	42	9,500	9,729
Bachelor Pass or 1st Prof. Degree	527	10,506	10,532
Bachelor Honours	248	10,980	11,501
Masters	257	10,500	11,113
Doctorate	567	12,350	12,649
Not Stated	*	*	*
Life Science - Total	1,044	9,840	10,108
Professional Certification	*	*	*
Bachelor Pass or 1st Prof. Degree	528	9,500	9,821
Bachelor Honours	133	8,400	9,150
Masters	140	9,500	9,857
Doctorate	238	11,000	11,466
Not Stated	-	-	-
Social Science - Total	872	11,200	11,946
Professional Certification	21	8,900	9,353
Bachelor Pass or 1st Prof. Degree	270	10,400	11,295
Bachelor Honours	91	12,420	15,417
Masters	440	12,000	11,553
Doctorate	50	12,500	13,729
Not Stated	-	-	-
Other Fields - Total	740	10,000	10,850
Field Not Stated	327	10,920	11,382
Final Total(1)	9,104	11,000	11,576

FOR EMPLOYERS IN CANADA, 1967
Education, Age Group and Median and Mean Earnings

Age Group					
40 - 44			45 - 49		
Number	Median	Mean	Number	Median	Mean
154	$12,876	$13,079	97	$12,000	$12,792
11	12,000	12,285	22	11,702	11,475
127	12,600	13,021	54	12,500	13,304
*	*	*	*	*	*
*	*	*	12	12,000	11,933
-	-	-	-	-	-
*	*	*	*	*	*
5,603	12,700	13,454	4,318	12,600	13,693
241	11,770	12,199	291	11,878	12,746
4,021	12,600	13,254	2,883	12,000	13,430
708	13,200	14,761	823	14,000	14,395
510	13,400	13,790	259	14,200	15,151
110	14,000	13,928	48	15,850	16,328
13	9,560	10,416	14	10,000	10,151
1,473	13,000	13,694	993	13,000	13,809
97	30,000	21,730	23	10,000	12,006
474	11,648	12,119	318	11,760	12,832
167	12,300	12,932	202	12,000	13,134
267	13,900	13,353	169	13,000	13,951
466	13,900	14,108	281	15,000	15,461
*	*	*	-	-	-
1,240	10,500	11,340	1,033	11,500	11,853
*	*	*	19	8,921	9,285
637	10,300	10,851	517	10,400	10,933
101	10,500	11,280	83	11,000	11,568
197	9,980	10,465	203	11,700	11,936
296	12,800	13,037	211	14,000	14,376
*	*	*	-	-	-
946	13,000	13,161	820	12,000	13,578
37	9,500	10,064	41	8,400	10,269
415	13,000	13,141	359	12,060	14,370
81	13,440	14,279	101	14,000	15,277
286	11,436	12,489	271	11,000	12,057
122	15,200	15,071	48	15,200	15,471
*	*	*	-	-	-
718	11,500	12,032	666	12,600	12,758
533	11,530	12,996	387	12,600	13,544
10,667	12,300	13,092	8,314	12,376	13,374

SCIENTISTS AND ENGINEERS WORKING
By Field of Principal Employment, Level of

Broad Field of Principal Employment, Level of Education	50 - 54		
	Number	Median	Mean
Architecture - Total	47	$12,150	$12,826
Professional Certification	*	*	*
Bachelor Pass or 1st Prof. Degree	24	12,000	12,540
Bachelor Honours	10	12,000	12,485
Masters	*	*	*
Doctorate	*	*	*
Not Stated	*	*	*
Engineering - Total	2,208	14,000	14,995
Professional Certification	177	13,500	12,638
Bachelor Pass or 1st Prof. Degree	1,518	14,000	14,943
Bachelor Honours	274	14,650	16,201
Masters	195	14,040	15,525
Doctorate	36	15,862	16,884
Not Stated	*	*	*
Physical Science - Total	824	13,000	14,195
Professional Certification	25	9,860	11,537
Bachelor Pass or 1st Prof. Degree	255	10,506	12,850
Bachelor Honours	160	14,500	15,266
Masters	198	12,000	13,090
Doctorate	184	16,000	16,710
Not Stated	*	*	*
Life Science - Total	747	10,400	11,309
Professional Certification	10	8,700	10,331
Bachelor Pass or 1st Prof. Degree	435	9,600	9,973
Bachelor Honours	62	11,500	12,239
Masters	114	11,950	12,145
Doctorate	120	15,000	14,954
Not Stated	*	*	*
Social Science - Total	502	12,000	13,537
Professional Certification	29	9,576	9,548
Bachelor Pass or 1st Prof. Degree	213	11,650	14,082
Bachelor Honours	69	13,000	15,344
Masters	130	11,000	11,638
Doctorate	57	14,760	15,452
Not Stated	*	*	*
Other Fields - Total	420	11,550	12,719
Field Not Stated	283	11,800	13,303
Final Total[(1)]	5,031	12,725	13,865

FOR EMPLOYERS IN CANADA, 1967
Education, Age Group and Median and Mean Earnings

Age Group					
55 - 59			60 - 64		
Number	Median	Mean	Number	Median	Mean
38	$12,000	$12,965	21	$12,000	$12,310
*	*	*	*	*	*
24	12,000	13,929	10	11,115	12,238
*	*	*	*	*	*
*	*	*	*	*	*
*	*	*	-	-	-
*	*	*	*	*	*
1,517	13,963	15,396	901	12,600	14,598
146	13,497	15,823	112	12,000	14,285
908	13,963	15,439	524	12,500	14,432
210	15,600	16,044	113	16,000	17,331
219	13,000	14,009	119	12,000	13,180
25	17,500	18,595	25	15,450	14,877
*	*	*	*	*	*
433	15,000	15,341	214	15,000	16,273
14	9,000	11,353	11	15,000	14,458
143	13,600	14,012	56	14,000	15,706
48	12,154	16,041	30	14,000	18,046
88	12,154	13,849	29	12,600	13,406
135	17,600	17,861	88	16,950	17,202
*	*	*	-	-	-
349	11,226	12,437	292	12,420	16,275
*	*	*	11	9,372	9,752
180	10,500	11,493	128	10,200	11,889
36	11,000	12,074	16	12,250	15,680
54	11,700	12,609	92	13,500	23,262
71	15,300	14,928	45	16,100	16,320
*	*	*	-	-	-
389	13,200	14,776	195	12,000	15,013
43	9,000	10,848	33	8,400	9,171
134	12,873	14,757	88	12,000	16,202
33	12,000	14,673	18	16,800	24,958
141	15,000	16,102	41	13,000	13,389
30	14,750	15,962	11	13,500	13,621
*	*	*	*	*	*
446	12,000	12,333	174	12,200	13,001
252	12,900	13,246	201	10,200	13,010
3,424	13,000	14,434	1,998	12,600	14,740

SCIENTISTS AND ENGINEERS WORKING
By Field of Principal Employment, Level of

Broad Field of Principal Employment, Level of Education	Age		
	65 and over		
	Number	Median	Mean
Architecture - Total	*	*	*
Professional Certification	*	*	*
Bachelor Pass or 1st Prof. Degree	*	*	*
Bachelor Honours	-	-	-
Masters	-	-	-
Doctorate	-	-	-
Not Stated	-	-	-
Engineering - Total	390	$13,000	$15,869
Professional Certification	76	11,000	11,782
Bachelor Pass or 1st Prof. Degree	245	14,700	16,505
Bachelor Honours	40	23,600	20,503
Masters	25	12,600	14,992
Doctorate	*	*	*
Not Stated	*	*	*
Physical Science - Total	40	13,000	13,572
Professional Certification	*	*	*
Bachelor Pass or 1st Prof. Degree	12	12,000	13,578
Bachelor Honours	*	*	*
Masters	*	*	*
Doctorate	17	15,200	14,379
Not Stated	-	-	-
Life Science - Total	65	11,244	12,433
Professional Certification	*	*	*
Bachelor Pass or 1st Prof. Degree	25	9,993	11,524
Bachelor Honours	*	*	*
Masters	19	10,200	11,313
Doctorate	11	14,300	15,116
Not Stated	*	*	*
Social Science - Total	53	9,500	12,969
Professional Certification	13	7,320	7,736
Bachelor Pass or 1st Prof. Degree	21	10,403	16,299
Bachelor Honours	*	*	*
Masters	*	*	*
Doctorate	*	*	*
Not Stated	*	*	*
Other Fields - Total	37	11,300	10,861
Field Not Stated	45	11,700	13,412
Final Total (1)	635	13,000	14,618

(1) Final total includes numbers less than 10 that were not quoted.
(2) Number reporting includes those who gave insufficient information on age.
- Not Reported
* Less than 10

TABLE II.12 (continued)

FOR EMPLOYERS IN CANADA, 1967
Education, Age Group and Median and Mean Earnings

Group		
Total		
Number(2)	Median	Mean
864	$10,800	$10,859
109	10,000	10,804
625	10,800	10,838
80	10,000	10,633
40	12,000	11,684
*	*	*
*	*	*
28,904	11,248	12,148
1,448	11,600	12,418
20,175	11,000	11,931
3,966	12,000	12,904
2,721	11,600	12,296
515	12,500	13,496
79	10,000	10,827
8,251	11,000	11,991
269	10,000	14,232
2,745	10,400	11,094
1,407	10,320	11,363
1,513	10,792	11,463
2,295	12,850	13,554
22	7,500	10,049
6,308	10,000	10,714
72	8,700	10,027
3,317	9,500	9,871
693	8,640	9,662
1,028	10,320	11,643
1,184	12,500	12,927
14	10,000	10,758
5,317	10,800	12,131
254	8,400	9,462
2,023	11,000	12,586
564	12,154	13,687
2,001	10,000	11,225
450	13,334	13,709
25	8,977	11,452
5,482	9,700	10,454
2,834	10,500	11,666
57,960	10,950	11,765

SCIENTISTS AND ENGINEERS WORKING
By Work Function, Level of Education,

Work Function	Professional Certification		
	Number	Median	Mean
Admin., Man.	617	$14,000	$15,423
Supervision	317	11,440	11,104
Man., Sup. of R & D	36	11,400	12,500
Research	42	8,140	8,948
Dev. Product or Tech.	61	9,860	9,920
Teaching, Ext. Work	51	6,600	7,903
Clinical Work	*	*	*
Counselling Pract., Case Work	54	7,100	7,549
Ind. or Man. Consulting	17	12,154	12,730
Const., Installation, Erection	33	10,400	11,196
Design	221	10,720	10,612
Field Exploration	12	8,270	8,559
Prod., Op., Mainten.	67	11,000	10,692
Testing, Insp., Qual. Control	54	9,400	8,937
Comp. Serv., Stat. Proc.	*	*	*
Stat. An., Forecasting	10	9,200	11,005
Pers. Tr. & Dev.	10	9,500	8,727
Ext. Work in Agr.	*	*	*
Publicity	*	*	*
Sales, Serv., Mktg., Pur.	76	10,800	11,050
Report, Tech. Writing, Ed.	21	10,000	10,393
Other	39	10,000	9,760
Not Stated	71	10,500	12,038
Final Total(1)	1,824	11,200	12,140

TABLE II.13

FOR EMPLOYERS IN CANADA, 1967
Median and Mean Earnings

Bachelor Pass or First Professional Degree			Bachelor Honours		
Number	Median	Mean	Number	Median	Mean
9,059	$13,000	$14,423	2,094	$14,700	$16,003
4,319	11,000	11,441	820	12,000	12,003
783	12,150	12,752	270	13,725	14,062
1,024	9,870	9,724	441	8,930	9,661
1,442	9,800	9,917	396	10,560	11,140
1,909	8,400	8,590	1,259	9,000	9,043
90	8,400	8,681	24	8,100	8,808
312	8,000	8,695	73	9,000	9,855
426	12,000	12,126	53	12,000	12,727
933	9,900	9,850	239	9,600	9,915
3,041	9,600	9,812	554	10,000	10,547
278	8,532	9,553	94	9,600	9,379
1,522	10,000	10,324	264	9,000	9,853
1,018	8,374	8,563	213	8,500	8,642
272	9,500	9,403	174	9,240	8,957
295	9,528	9,728	74	10,000	10,331
147	10,050	10,038	28	10,600	10,716
379	9,000	9,032	62	8,600	9,634
39	10,000	10,996	15	10,700	11,043
1,994	10,320	11,342	400	11,500	11,843
442	10,020	10,792	222	10,000	9,625
1,248	9,579	9,735	285	10,600	11,067
1,409	10,300	11,626	311	10,900	12,088
32,381	10,506	11,493	8,365	11,000	11,898

SCIENTISTS AND ENGINEERS WORKING
By Work Function, Level of Education,

	Masters		
	Number	Median	Mean
Admin., Man.	1,875	$13,800	$15,182
Supervision	582	11,000	11,136
Man., Sup. of R & D	352	13,000	13,775
Research	1,195	9,750	10,102
Dev. Product or Tech.	285	11,000	10,975
Teaching, Ext. Work	1,483	10,500	10,634
Clinical Work	22	7,700	8,424
Counselling Pract., Case Work	293	7,700	7,999
Ind. or Man. Consulting	82	12,000	12,609
Const., Installation, Erection	31	11,000	11,290
Design	459	10,000	10,296
Field Exploration	99	9,816	10,345
Prod., Op., Mainten.	82	10,800	11,470
Testing, Insp., Qual. Control	106	8,900	9,746
Comp. Serv., Stat. Proc.	70	9,500	9,947
Stat. An., Forecasting	125	11,000	10,962
Pers. Tr. & Dev.	71	9,000	9,784
Ext. Work in Agr.	82	9,420	9,344
Publicity	11	10,896	11,742
Sales, Serv., Mktg., Pur.	125	11,300	11,941
Report, Tech. Writing, Ed.	128	10,500	10,950
Other	276	9,403	10,779
Not Stated	287	11,000	11,575
Final Total(1)	8,121	11,000	11,729

(1) Final total includes numbers less than 10 that were not quoted.
(2) Number reporting includes some respondents who gave insufficient information on education.
- Not reported
* Less than 10

TABLE II.13 (continued)

FOR EMPLOYERS IN CANADA, 1967
Median and Mean Earnings

Doctorate			Total		
Number	Median	Mean	Number(2)	Median	Mean
583	$17,000	$17,520	14,806	$13,700	$14,933
61	14,150	14,661	6,433	11,000	11,425
408	16,400	16,894	1,913	13,500	14,053
1,895	12,000	12,523	4,898	10,500	11,021
74	12,600	12,990	2,319	10,000	10,341
1,393	11,200	11,813	6,347	9,600	9,899
16	13,000	13,490	162	8,500	9,201
*	*	*	789	7,800	8,421
*	*	*	655	12,120	12,403
-	-	-	1,269	9,900	9,929
37	10,300	11,112	4,447	9,750	10,029
18	12,500	12,595	522	9,400	9,784
*	*	*	1,993	10,000	10,317
*	*	*	1,454	8,500	8,688
*	*	*	542	9,240	9,377
*	*	*	534	10,000	10,202
*	*	*	271	10,000	10,050
*	*	*	547	9,000	9,126
*	*	*	72	10,300	10,917
*	*	*	2,711	10,500	11,404
85	13,670	13,711	926	10,000	10,780
52	13,364	14,960	1,988	9,600	10,165
145	12,500	13,127	2,362	10,700	11,745
4,820	12,700	13,386	57,960	10,950	11,765

APPENDIX III

THE 1967 SURVEY OF SCIENTISTS AND ENGINEERS

APPENDIX III

1967 SURVEY OF SCIENTISTS AND ENGINEERS

The 1967 Survey was designed to collect several types of information for use by the Department of Manpower and Immigration and by other institutions interested in the field of highly qualified manpower. The main purpose of the survey was to provide information which could be used for assessing the resources of highly qualified manpower in Canada, their deployment and utilization, their education and experience, their movement between the educational system and employment, their geographical and occupational mobility, and their earnings from employment. The survey provides data in considerable detail about an important section of highly qualified manpower, namely scientists and engineers. The data covers various aspects of the career profiles of scientists and engineers including their educational attainments and fields of study, places of birth, fields of employment and scientific experience. The employment profiles are cross-classified by fields of specialization, industries of employment, work functions and salaries earned.

The survey was a continuation and development of the series of surveys of scientists and engineers previously carried out by the Department of Labour. The earliest surveys had collected a limited amount of information by means of mailed questionnaires. One-third of the population of scientists and engineers who were on the mailing list of the Department was surveyed each year so that the total population was covered in a three-year cycle. The results of the earlier surveys referred therefore to a sample of scientists and engineers and did not include estimates of the total population. The 1967 Survey however, was designed to collect considerably more information, and estimates of the population of scientists and engineers were made on the basis of the results.

A common questionnaire(1) was used for the survey, which was conducted at the same time for the entire survey population of scientific and engineering professions. This was done in order to obtain information comparable in concept and definition for all occupations. Further studies of the projected requirements for scientists and engineers and of their movements between fields of study and of employment would then have a firm basis of comparable data. The classification system used for fields of study and of employment closely matched that used by the National Science Foundation in the United States of America for surveying professional occupations. In this way data was provided which was comparable

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(1) Given at the end of Appendix III.

between occupations both within Canada and between Canada and the United States of America. The questionnaires were distributed to individual scientists and engineers on the basis of a mailing list maintained by the Department of Manpower and Immigration. The mailing list was developed from that used by the Department of Labour for earlier surveys and was drawn together from a variety of sources including professional registers, surveys of graduating classes of Canadian universities and names supplied by employers. The survey was designed with the assistance of an advisory committee which included representatives of the Economic Council, the Dominion Bureau of Statistics, the (then) Science Secretariat and several professional associations.

The questionnaire was developed as a result of experience gained in the conduct of a survey of psychologists in collaboration with the Canadian Psychological Association early in 1966. It was discussed with the other institutions and was tested in a pilot survey in October 1966.

The first mailing was carried out in January 1967 and questionnaires were sent to some 91,000 scientists and engineers. Those who did not respond within three weeks were sent a reminder card and questionnaires were sent to the initial non-respondents in two subsequent mailings. Of approximately 62,000 scientists and engineers who responded, slightly over 3,000 were resident outside Canada. A sample follow-up survey was then made of the non-respondents in Canada by the Manpower Division of the Department through the Canada Manpower Centres. The overall response to the survey, including the sampled respondents, unusable questionnaires and those which arrived too late for inclusion, was about 74% of the initial mailed population. An estimation procedure which was developed by Professor D.K. Dale(1) was then used to arrive at an estimated total population of scientists and engineers which took account of the characteristics of the non-respondents. Adjustments were made to take account of the geographical mobility of the non-respondents in order to reflect the actual geographical distribution of the total population of scientists and engineers. The final survey population was estimated to be 77,000. The difference between this figure and the initial mailed population can be attributed to three main factors: first, the initial population still contained some duplications of scientists and engineers who belonged to more than one professional association; second, the estimation procedure made allowance for natural attrition and out migration, but not for natural increase or in-migration; third, the follow-up survey of non-respondents on which the estimates were based was conducted only for scientists and engineers in Canada. Non-respondents abroad were not surveyed.

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(1) Chairman of the Department of Mathematics at Carleton University, Ottawa.

In the preparation of the mailing list, the conduct of the survey and the processing of the results, a number of tests and checks were carried out to ensure accuracy. The mailing list compiled from the membership lists of various associations was checked to eliminate duplication as far as possible. Questionnaires received from respondents were processed through an error-edit routine to verify the logical consistency of the replies; they were tested to ensure that the estimation procedure was correctly applied. The tables produced from the survey were verified against the definitions and specifications of the population covered by each table and were discussed with representatives of the professional associations and other government departments.

Although the list of names and addresses used in the survey was brought up to date as much as possible, the survey cannot have included all individuals in the total universe of scientists and engineers in Canada at the time. The Department considers, however, that the population of scientists and engineers covered by the survey represented a very large proportion of the Canadian total. There are few external sources which can be used to check the extent to which the estimated survey population corresponds with the universe of scientists and engineers. Some check on coverage can be made in the case of those professions which are practised by licence under statute such as architecture and engineering. In these cases it is thought that the population of the survey corresponded very closely to the total number of professionals in Canada in 1967. Caution should be exercised in comparing the totals with information obtained from other sources. For example, the total of names and addresses on the mailing lists which were received from all the professional associations and other sources was approximately 98,900. After checking for obvious duplications approximately 91,000 questionnaires were mailed. This indicates that there were many who were members of more than one professional association and some duplications still existed at the time that the survey was mailed.

Since the data are estimates of the population of scientists and engineers rather than an actual count of all members of the population, they are subject to statistical variability. In principle, the larger estimates are subject to less variance than the smaller ones. For this reason estimates of less than 100 should be used with caution. In some cases such as, for example, the distribution by age-group or salary group, the groups themselves are quite small and consolidation is necessary.

Further information about the survey may be obtained from the General Surveys Division, Manpower Information and Analysis Branch, Department of Manpower and Immigration, Ottawa. Copies of tables which have been produced from the survey may be obtained free of charge. Additional tables of a special nature from the survey may be provided at cost.

DEPARTMENT OF MANPOWER AND IMMIGRATION

PROFESSIONAL, SCIENTIFIC AND TECHNICAL MANPOWER SURVEY 1967

CONFIDENTIAL

THE INFORMATION YOU ARE ASKED TO GIVE WILL NOT BE RELEASED IN ANY WAY THAT CAN BE IDENTIFIED WITH YOU.

Please enter your **FULL NAME** and **ADDRESS** below

FIRST NAME — MIDDLE OR OTHER NAME
MR.
MRS.
MISS

LAST OR FAMILY NAME

NO. AND STREET

CITY OR TOWN — ZONE — PROVINCE

PLEASE READ CAREFULLY ALL INSTRUCTIONS BEFORE ANSWERING QUESTIONS

PLEASE PRINT CLEARLY

Please give mailing or forwarding address through which you can always be reached if different from the above address.

C/O
NO AND STREET
CITY OR TOWN — ZONE — PROVINCE

PERSONAL INFORMATION

1. SOCIAL INSURANCE NO. ☐☐☐—☐☐☐—☐☐☐

2. SEX
   1. ☐ Male
   2. ☐ Female

3. DATE OF BIRTH
   Day ______
   Month ______
   Year ______

4. PROVINCE OF BIRTH (or country if not in Canada)

Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.
☐ 000	☐ 001	☐ 002	☐ 003	☐ 004	☐ 005	☐ 006	☐ 007
Alta.	**B.C.**	**Yukon, N.W.T.**	**U.S.A.**	**U.K.**	**France**	**Other (Specify)**	
☐ 008	☐ 009	☐ 010	☐ 020	☐ 100	☐ 111	☐ ________	

(IF BORN OUTSIDE CANADA OF CANADIAN PARENTS, CHECK HERE ☐)

5. IF NOT BORN IN CANADA, GIVE YEAR OF PERMANENT ENTRY TO CANADA ________

6. PROVINCE OF RESIDENCE, 1967 (or Country if not in Canada)

Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.
☐ 000	☐ 001	☐ 002	☐ 003	☐ 004	☐ 005	☐ 006	☐ 007	☐ 008
B.C.	**Yukon, N.W.T.**	**U.S.A.**	**U.K.**	**France**	**Other (Specify)**			
☐ 009	☐ 010	☐ 020	☐ 100	☐ 111	☐ ________			

(IF PROVINCE OF RESIDENCE IN 1966 WAS DIFFERENT, ENTER CODE HERE)

7. IF NOT RESIDENT IN CANADA, GIVE YEAR OF DEPARTURE FROM CANADA ________

8. CITIZENSHIP 2 JANUARY 1967
   011 ☐ Canadian
   020 ☐ U.S.A.
   100 ☐ U.K.
   111 ☐ France
   ☐ Other (Specify)

9. IF NOT CITIZEN OF COUNTRY IN WHICH YOU NOW RESIDE, CHECK ONE:
   1. ☐ Landed Immigrant
   2. ☐ Temporary Status

10. PROVINCE OF SECONDARY SCHOOL GRADUATION (or country if not in Canada)

Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.
☐ 000	☐ 001	☐ 002	☐ 003	☐ 004	☐ 005	☐ 006	☐ 007	☐ 008
B.C.	**Yukon, N.W.T.**	**U.S.A.**	**U.K.**	**France**	**Other (Specify)**			
☐ 009	☐ 010	☐ 020	☐ 100	☐ 111	☐ ________			

11A. MARITAL STATUS
   1. ☐ Single
   2. ☐ Married
   3. ☐ Separated, Widowed, Divorced

11B. DEPENDENTS
   1. List the ages of all dependents residing with you
      — — — —
      — — — —
   2. Circle, above, the ages of those dependents attending school.

EDUCATION

12. HIGHEST EARNED UNIVERSITY DEGREE
   1. ☐ Bachelor's
   2. ☐ M.D., D.D.S., DVM
   3. ☐ Master's
   4. ☐ Ph.D
   5. ☐ D.Sc.
   6. ☐ Professional Certification/Registration Only

13. PROFESSIONAL CERTIFICATION/REGISTRATION
   (a) Do you have Professional Certification or Registration 1. ☐ Yes 2. ☐ No
   (b) If yes, please indicate:

Board or Professional Assn.	
Province Certified/Registered (or Country if not Canada)	
Field of Training (Please enter code number of Major Field – list A)*	
Year Certified/Registered	
Was this awarded by examination	1. ☐ Yes 2. ☐ No

* From the enclosed **MAJOR FIELD and SPECIALTIES LIST.**

14. UNIVERSITY EDUCATION – Please report both *degrees awarded*, and *degrees for which you are presently studying* under the appropriate categories in answering question 14, PARTS A TO E.		BACHELOR'S AND FIRST PROFESSIONAL (Incl. M.D., D.D.S. and D.V.M.)		MASTER'S			
		FIRST DEGREE	SECOND (if any)	FIRST DEGREE	SECOND (if any)	Ph.D.	D.Sc.
A. NAME OF UNIVERSITY (or college etc.)							
B. PROVINCE OF UNIVERSITY (or country if not Canada)	000 Newfoundland	☐	☐	☐	☐	☐	☐
	001 Prince Edward Island	☐	☐	☐	☐	☐	☐
	002 Nova Scotia	☐	☐	☐	☐	☐	☐
	003 New Brunswick	☐	☐	☐	☐	☐	☐
	004 Quebec	☐	☐	☐	☐	☐	☐
	005 Ontario	☐	☐	☐	☐	☐	☐
	006 Manitoba	☐	☐	☐	☐	☐	☐
	007 Saskatchewan	☐	☐	☐	☐	☐	☐
	008 Alberta	☐	☐	☐	☐	☐	☐
	009 British Columbia	☐	☐	☐	☐	☐	☐
	010 Yukon, N.W.T.	☐	☐	☐	☐	☐	☐
	020 U.S.A.	☐	☐	☐	☐	☐	☐
	100 U.K.	☐	☐	☐	☐	☐	☐
	111 France	☐	☐	☐	☐	☐	☐
	999 Other (Specify)						
C. COURSE OF STUDY (Please enter code number of MAJOR FIELD and SPECIALTY)	MAJOR FIELD (List A)*						
	SPECIALTY (List B)*						
D. DEGREE OR DIPLOMA EARNED (Specify title of degree or diploma e.g. B.Sc., B.Ed.)		check if Hons. ☐	check if Hons. ☐				
E. YEAR DEGREE AWARDED OR EXPECTED	AWARDED						
	EXPECTED						

SCIENTIFIC OR PROFESSIONAL EXPERIENCE

15. What scientific or professional experience (other than formal education) have you had prior to your employment in 1966.

	Greatest Experience	2nd Experience	3rd Experience	4th Experience
PLEASE ENTER CODE NUMBER OF SPECIALTY (LIST B)*				
NUMBER OF YEARS OF EXPERIENCE				

PROFESSIONAL IDENTIFICATION

16. Please specify your Professional Identification by completing the following:
Based on my total education and experience, I regard
myself professionally as a(an): ______________________________

PROFESSIONAL ASSOCIATION MEMBERSHIP

17. Please list all professional associations and technical societies of which you are a member (abbreviations accepted):

LABOUR FORCE STATUS

18. PRINCIPAL LABOUR FORCE STATUS DURING 1966 (Check one only)

Working for an employer 1. ☐ Self employed 2. ☐ Student 3. ☐
Housewife 4. ☐ Retired 5. ☐ Other (Specify) 6. ☐ ____________

19. LABOUR FORCE STATUS AS OF JANUARY 2, 1967 (Check one only)

Working for an employer 1. ☐ Self employed 2. ☐ Student 3. ☐
Housewife 4. ☐ Retired 5. ☐ Other (Specify) 6. ☐ ____________

* From the enclosed MAJOR FIELD and SPECIALTIES LIST.

EMPLOYMENT

If you held any employment in either 1966 or 1967, please report it in the appropriate categories in answering questions 20 to 23E.

PRINCIPAL EMPLOYMENT ▶ refers to the job to which most time was devoted. Includes full-time jobs (i.e. jobs for which the usual work week was 35 hours or more). If two or more principal jobs of equal duration were held in 1966, report the more recent one.

SECONDARY EMPLOYMENT ▶ refers to additional jobs held at the same time as principal employment (or principal labour force status, if not employed). Includes part-time jobs (less than 35 hours a week) or summer vacation employment. If more than one secondary job was held, report job from which greatest income was derived.

FOR EACH RELEVANT EMPLOYMENT CATEGORY ANSWER QUESTIONS 20 TO 22 ▼		Principal Employment during 1966	Secondary Employment during 1966	Principal Employment as of 2 January 1967
20. PROVINCE OF EMPLOYMENT (or Country if not Canada)	000 Newfoundland	☐	☐	☐
	001 Prince Edward Island	☐	☐	☐
	002 Nova Scotia	☐	☐	☐
	003 New Brunswick	☐	☐	☐
	004 Quebec	☐	☐	☐
	005 Ontario	☐	☐	☐
	006 Manitoba	☐	☐	☐
	007 Saskatchewan	☐	☐	☐
	008 Alberta	☐	☐	☐
	009 British Columbia	☐	☐	☐
	010 Yukon, N.W.T.	☐	☐	☐
	020 U.S.A.	☐	☐	☐
	100 U.K.	☐	☐	☐
	111 France	☐	☐	☐
	999 Other (Specify)			

21. TYPE OF EMPLOYER OR BUSINESS		Code	Principal Employment during 1966	Secondary Employment during 1966	Principal Employment as of 2 January 1967
(Please check nature of employer's business or your business if self-employed)	**INDUSTRY**				
	FARM AGRICULTURAL, VETERINARY SERVICE	01	☐	☐	☐
	FOREST SERVICE OR OPERATION	02	☐	☐	☐
	FISHERIES OR FISHING OPERATION	03	☐	☐	☐
	MINE, QUARRY, OIL WELL	04	☐	☐	☐
	MANUFACTURING CONCERN (all products)	05	☐	☐	☐
	CONSTRUCTION FIRM	06	☐	☐	☐
	TRANSPORTATION ORGANIZATION OR SERVICE (air, water, road, rail)	07	☐	☐	☐
	COMMUNICATIONS ORGANIZATION (telephone, broadcasting, post office)	08	☐	☐	☐
SPECIAL NOTE FOR FEDERAL, PROVINCIAL AND MUNICIPAL EMPLOYEES.	UTILITY (electrical, gas, water) (incl. govt. boards)	09	☐	☐	☐
Only government establishments primarily engaged in public administration are classified to government.	TRADE OUTLET (wholesale or retail)	10	☐	☐	☐
Employees of a government department, branch, section or agency engaged in the industrial, educational or service activities specified here classify their employer to THOSE activities and not to government.	FINANCIAL INSTITUTION (bank, credit, insurance, real estate)	11	☐	☐	☐
	HEALTH OR WELFARE ORG. OR SERVICE (hosp., phys. office etc.)	12	☐	☐	☐
	PROFESSIONAL SERVICE (except health, veterinary)	13	☐	☐	☐
	OTHER ORG. OR SERVICE (prof. assoc., church, hotel, theatre etc.)	14	☐	☐	☐
	EDUCATION ELEMENTARY, SECONDARY SCHOOL (or school system)	15	☐	☐	☐
	VOCATIONAL SCHOOL (except Institute of Tech.)	16	☐	☐	☐
	INSTITUTE OF TECHNOLOGY	17	☐	☐	☐
	UNIVERSITY, COLLEGE	18	☐	☐	☐
	OTHER EDUCATIONAL ORGANIZATION (library, museum)	19	☐	☐	☐
	GOVERNMENT (Public administration only) ARMED FORCES	20	☐	☐	☐
	FEDERAL DEPARTMENT OR AGENCY	21	☐	☐	☐
	PROVINCIAL DEPARTMENT OR AGENCY	22	☐	☐	☐
	LOCAL DEPARTMENT OR AGENCY	23	☐	☐	☐
	FOREIGN GOVERNMENT	24	☐	☐	☐

22. EMPLOYER OR BUSINESS		Name of Employer or Business	No. Street and City	Department or Relevant Unit	Employer's Activity
Please give name, address and activity of your employer or your business if self-employed.	PRINCIPAL EMPLOYMENT DURING 1966 ▶				
	SECONDARY EMPLOYMENT DURING 1966 ▶				
	PRINCIPAL EMPLOYMENT AS OF 2 JANUARY 1967 ▶				

FOR EACH RELEVANT EMPLOYMENT CATEGORY ANSWER QUESTION 23, PARTS A TO E		Principal Employment during 1966	Secondary Employment during 1966	Principal Employment as of 2 January 1967
23. A. TYPE OF EMPLOYMENT	Check whether working for an employer or self-employed (incl. partnership)	☐ For an employer ☐ Self-employed	☐ For an employer ☐ Self-employed	☐ For an employer ☐ Self-employed
B. TITLE OF POSITION (if applicable)				
C. PLEASE ENTER CODE NUMBER OF EMPLOYMENT SPECIALTY (LIST B)				
D. WORK FUNCTIONS	01 ADMINISTRATION, MANAGEMENT (except of research)	01	01	01
	02 SUPERVISION (except of research)	02	02	02
	03 MANAGEMENT, SUPERVISION OF R & D	03	03	03
	04 RESEARCH	04	04	04
	05 DEVELOPMENT, PRODUCT OR TECHNICAL	05	05	05
	06 TEACHING, EXTENSION WORK	06	06	06
	07 CLINICAL PRACTICE	07	07	07
	08 COUNSELLING PRACTICE, CASE WORK	08	08	08
Please **RANK** in order of time devoted. For example, indicate "1" for the function at which you spend the greatest amount of time, "2" for the second greatest, etc. Indicate only those functions taking at least ½ day per week.	09 INDUSTRIAL OR MANAGEMENT CONSULTING	09	09	09
	10 CONSTRUCTION, INSTALLATION, ERECTION	10	10	10
	11 DESIGN	11	11	11
	12 FIELD EXPLORATION	12	12	12
	13 PRODUCTION, OPERATION, MAINTENANCE	13	13	13
	14 TESTING, INSPECTION, QUALITY CONTROL	14	14	14
	15 COMPUTER SERVICE, STATISTICAL PROCESSING	15	15	15
	16 STATISTICAL ANALYSIS, FORECASTING	16	16	16
	17 PERSONNEL TRAINING and DEVELOPMENT	17	17	17
	18 EXTENSION WORK IN AGRICULTURE	18	18	18
	19 PUBLICITY (public relations, speeches, broadcasting, journalism)	19	19	19
	20 SALES, SERVICE, MARKETING, PURCHASING	20	20	20
	21 REPORT, TECHNICAL WRITING, EDITING	21	21	21
	22 OTHER (specify)	22	22	22

E. INCOME AND DURATION OF EMPLOYMENT			
Definitions "Income" refers to gross income from employment. (i.e. total of salary, commissions, bonuses etc.) "Full Time" means a usual work week of 35 hours or more. "Part Time" means less than 35 hours a week.	(a) Annual income from principal employment in 1966. ______ (b) No. of months employed. (Include vacation, paid sick leave) ______ (c) If employed less than 12 months, give annual *rate* of income. ______	(a) Income from *above* secondary employment in 1966. ______ (b) No. of months employed at *above* secondary employment ______ (c) Was the *above* secondary employment Summer vacation only full-time ☐ Summer vacation only part-time ☐ Part-time during the year ☐ (d) Income from *all* secondary *employment* in 1966. ______	(a) Annual rate of remuneration from principal employment as of 2 January 1967 ______

* From the enclosed MAJOR FIELD and SPECIALTIES LIST.